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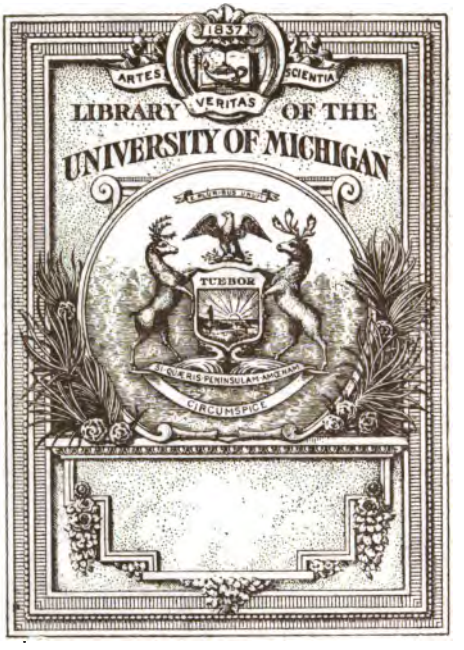
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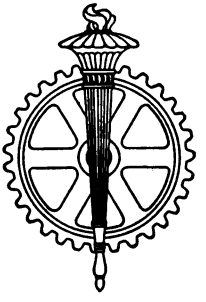
Choosing Employees

By Mental and Physical Tests

BY

WILLIAM FRETZ KEMBLE



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Chapter I

THE PRACTICAL POSSIBILITIES

The increase of profits that may be secured by adopting easily workable test-systems for choosing employees, is proven by typical cases found in recent practice. This is followed by a graphic description of the actual application of such tests to piece-workers, typists, bookkeepers, and clerks. We see the "labor-standardizer" at work, and the applicants under examination by match-board tests for right-hand and left-hand dexterity, ambidexterity, eye-and-hand co-ordination, range of eye-sight, mathematical speed and accuracy, comprehension and imitation.

"IF I could find any way of choosing and hiring employees who were one-half as good, relatively, as the machines I can buy, my success would be enormous," said a manufacturer in the western United States, writing to the editor of *The Engineering Magazine.*

"The most efficient machinery (excepting rarely that controlled by exclusive patent) is available alike to all manufacturers, and the main factor of difference between the successful and the unsuccessful plant is the human element by which machinery is operated."

Consider for a moment not even this potential increase of efficiency, but the mere waste of the "hire-and-fire" policy in a plant employing many hands. It is generally conceded that it costs from $25 to $200 to train a new employee for his job. If a firm, by careful

selection, can save the hiring of one thousand new employees a year, it will at least have $25,000 more on the profit account for its annual statement. The standardizer for one of our large mail houses asserts that under a recently applied system of examination and selection they have to take on only one person where formerly they hired four. And a further saving in this use of "labor standardization" consists in the reduction of overhead charges. Many manufacturers could get on with 20 per cent less space and machinery if their help were properly classified before being put on the job. It follows that firms confronted with the apparent necessity of raising more capital for space and apparatus can solve the problem by simply setting scientific standards of work.

Furthermore, a similar waste may be present, though concealed, in the small staff as well as in the large force. It is not necessary to carry the sum into the thousands of cases to obtain a heavy balance on the wrong side of the dollars and cents. A single mistake in placing a man may cost more than the introduction of a scientific employment system. This is well illustrated in a series of tests recently completed for a corporation, proving that one of the $2,500-a-year men showed no capacity beyond the $1,000-a-year clerks. This man was a charming fellow and had won his way to a high position through social qualities. The general manager looked over a comparative chart of his staff which had been prepared from the test data, and found this employee at the bottom of the list. He smilingly acknowledged that the findings were right; but he had never had the heart either to reduce or discharge the incubus. In the last ten years this man had been paid $15,000 more than he was worth. A system

based on tests and continuous, visible records, by its mere silent insistence would have made such a loss impossible.

These are but a few suggestive illustrations of the many economies resulting from a definite employment policy. The principal results may be enumerated as follows:

1. The saving of salaries paid to incompetents, as illustrated above.

2. Readjustment to positions in which employees can give greater returns for their salaries. This is illustrated in the case of a stenographer who was on the verge of being discharged for incompetence when one of our tests brought out the fact that he was an extraordinary mathematician. The loss involved in only a few such cases will affect dividends at the end of the year.

It is probably not an extravagant statement to say that test systems are already so far refined that many plants could save 25 per cent of their labor and overhead charges by "standardizing" their employees. Certainly many employers could rise beyond the stage of bare existence, and show substantial profits, while their workmen made a corresponding gain through being set at the tasks for which they have most natural aptitude and hence largest chance of reaching their maximum earnings.

Possibly one of the reasons why Germany secured the markets of the world was the fact that she did not suffer the enormous waste tolerated by other countries in training new employees. The German manufacturer knows approximately what a man can do before being put on his job. He does not guess. He refers to the applicant's "Arbeits Buch" or "Work Book." By law, every German workman must carry this with him

and every employer must enter in it the man's exact record. Misrepresentation in such a record is subject to legal redress by an employee or later employer. Thus the expensive process of finding out what a man can do is largely eliminated, since the German employer knows from his past record. Of course, in America we would never "stand for" anything like this; but we are approaching a solution of the labor question, and solved this question certainly will be within the next twenty years. It is safe to predict that by that time we shall know with almost 100 per cent accuracy just what a man can do before he is put on a job.

3. Saving of training expenses.

4. The saving resulting from an automatic promotion system. We have repeatedly found capable men who are on the verge of seeking other jobs because they see no chance of advancement. Their loss would be one of those intangible things hard to rate in cash, but it is more of a material money factor than many business men realize.

If employers so desire, the initial record found by the tests given to each applicant for a position may be followed up by monthly reports of the work of every employee, all reduced to a card system. Upon these records will be based promotion, those highest on the list being automatically advanced, and those lowest being dropped in slack times; all based with unerring mathematical precision on the employees' own abilities and efforts. Too much stress cannot be laid on the importance of some system of promotion, as many forces are disorganized when good effort is uniformly disregarded and men are promoted through ignorance, guesswork, and favoritism.

Fortunately for the aspirations of the manufactur-

JOHN M. BRUCE

Mr. Bruce, with Prof. Walter D. Scott, originated a testing system for salesmen. Its application to the force of the American Tobacco Company showed a success about three times as great as that attained by former methods.

PROF. WALTER DILL SCOTT

Director of the Bureau of Salesmanship Research at the Carnegie Institute of Technology. He has acted for a number of companies in introducing employment tests.

ers quoted at the opening of this chapter—fortunately for all employers seeking at once the fairest deal to their employees and the greatest efficiency in the conduct of their own business—the science of management has advanced to a point where we can attain a very large part of the ideal of fitting every man to his job *before* putting him to work.

Too much importance cannot be given to the necessity of getting a mathematical basis for reckoning human capacity, and such a system of accurate rating it is purposed to outline here. The essentials of personal efficiency must be either mental, or physical, or both. The essentials for any particular job are limited. It is the business of the standardizer to find out these requisites, and to find the corresponding mental and physical qualities of the individual who will be most fit for that particular job.

Interest is very much alive on the subject, as one will find in picking up almost any recent magazine. Many authors are writing of methods by which employers are getting a more definite line on their employees' capacity. The new occupations of Vocationalist and Labor Standardizer have just arisen within the last few years, and two schools of practice are already in the field. The first is that of which Mr. William J. Kibby, Dr. Katherine M. H. Blackford and Miss J. A. Fowler are the exponents, and is based on observation. The second school has among its practitioners Mr. John M. Bruce, Prof. Walter Dill Scott, and Mr. Sherwin Cody. It is based on the psychological method. This system embodies the use of actual tests made with every individual to find out his natural characteristics and limits. The two schools are not in opposition, and will, no doubt, combine in a uniformity of methods.

We will go into a factory test-room and see how the questions of individual qualities, physical and mental, are being solved, and the fitness or unfitness of each applicant for any particular job is ascertained.

You will see a set of scales with a height rod attached. On the wall will be a spirometer—a meter for registering lung capacity. That is about all the apparatus apparent until you look at a row of tables upon which some strange boards are placed. You surmise that these boards must be some kind of game, and you will not be far wrong, for it is a new method of playing the great game of business.

You are introduced to a young man with a craggy, precipitous countenance like Abe Lincoln's. Efficiency bristles in his every attitude; but of great importance is the kindly gleam in his eyes, for he must inspire confidence, and be able to set people at their ease. You meet his co-worker, a great, round, jovial personality.

One by one come into the room some girls to be tested. They are plainly nervous. Our friend, Abe the Second, gets them seated in large, comfortable chairs. He asks the names and addresses, and makes note of what experience they have had. Nothing unusual in this, but now he looks at one girl and with a genial smile says: "Let me see. What is the color of your eyes?" She stares at first and then she smiles. According to the Blackford system, the color of the eyes, hair, and skin are all of importance. Abe the Second makes a note of all these characteristics for statistical data, and does it openly, for it strikes the sense of humor in the girls and helps to calm their nerves. He then records their weight and height. Next he gets up a contest to see which can blow the most wind into the spirometer. Another contest comes on the dynamometer, a small

SHERWIN CODY

Managing Director, Associated Schools of Scientific Business. Mr. Cody is endeavoring to bring uniformity in the methods of conducting written business tests throughout the United States.

set of springs which is grasped by the hand to test the strength of grip.

The tests thus far have been observational and physical. Now we come to the type of records made by the newer, or psychological, school.

By this time all the girls are comparatively calm and eager to play the game. They are seated at the tables and care is taken that their arms swing at about the same level over the boards. They see before them a game consisting of a board full of holes in lines and in various groups. To the left of the board is screwed a wooden match-box full of headless match-sticks. They are told that they are now to play this new game, and that each is to try to beat the other in placing the most match-sticks in the holes.

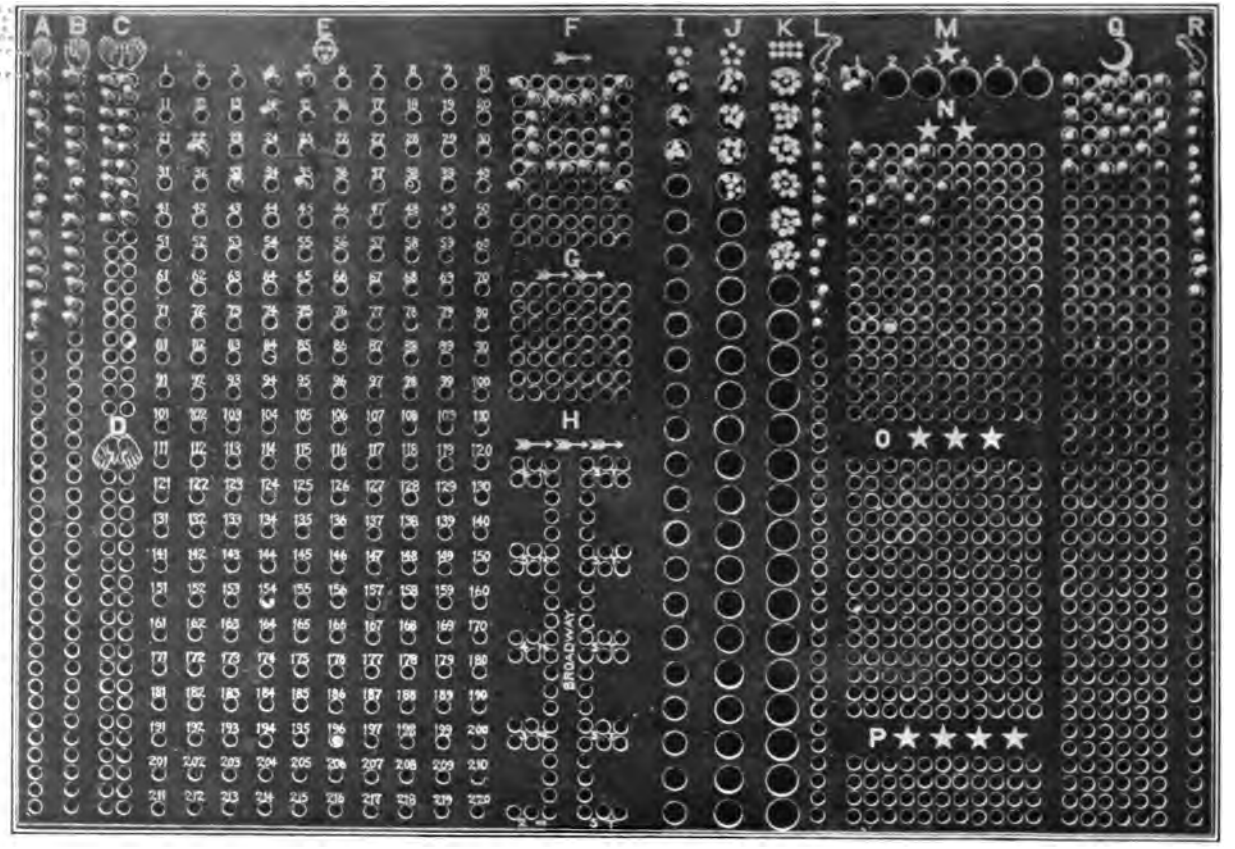
The first test consists in a rating of their right-hand dexterity. They are carefully instructed to use their right hands and take only one match at a time and fill as many holes as possible. At a signal they commence filling the first row of holes. At the end of thirty seconds they are told to stop.

What they have done is significant. If a girl has filled only twelve holes, Abe the Second knows that she can probably never make great speed at small piece work; if she has filled sixteen, Abe knows that she will about measure up to average factory ability; if she has filled twenty, Abe is very much elated and knows he has found a treasure. The same trial is then made with the left hand. Then the two hands are tried at once on a double row of holes to test ambidexterity. This test is repeated to find whether a girl can learn quickly.

Now comes a new type of test: On the wall large numbers appear every two seconds. On her board the girl

sees a group of holes numbered consecutively. She is to find the corresponding number on the board and stick a match in it. This will test the quickness of her eye and the response of the hand to the eye. A similar test is made to find the response of the hand to ear impulses.

MATCH-BOARD IN OPERATION



LAYOUT OF THE MATCH-BOARD

Next, on the wall is shown a chart with numbers ranging from very large to very small. The girl is to find as many corresponding numbers as possible on her board and put sticks therein. This will test the range of her eyesight.

Ten very easy examples are then given, the answers to which will be found in corresponding numbers on the board. Abe can thus classify his girls as so much above or below average in mathematical speed and accuracy. He has long ago recovered from his surprise that mathematics is almost an unknown science among factory girls, although his tests among men show good records.

Now the girls see before them a set of holes laid out like a street and side streets. This is a test of their ability to comprehend verbal instructions. They listen carefully while directions are given for filling three of these holes, and then they try to do as they are told. Alas for human comprehension! Few people can hold several things in their mind at once (which is a necessity of comprehension) if the matter to be understood is in the slightest degree complicated. Should a girl be able to do here exactly as told she has ability far above ordinary piece-work qualifications. But failure here is not fatal. It may show that she will be slow to learn, but it will have no necessary influence on her speed once she has learned her new work.

Akin to this is the test in imitation. Abe props a large board full of holes against the wall, and taking large sticks tells the girls to imitate him exactly. He then proceeds to fill twenty holes in the form of a design. If a girl cannot comprehend verbal directions she may be able to imitate certain actions when shown; and the result is much better here, though few can do the task perfectly. This also will not give any rating

on speed, but will show how quickly the girl can be taught and will have some bearing on the expense of teaching her.

Already many positive results have been shown. The average on every test is known, and the number of matches set up gives a direct numerical rating very quickly read. Abe knows immediately whether a girl is going to be above average. Unfortunately, Abe may not be sure that the girl is *below* average, for it happens in about one case in ten that she still may have some remnant of nervousness; but unhappily that is the girl's misfortune and not the firm's, for, if the labor market is full, another girl just as good will be found without the nervous factor. However, one thing is sure—Abe knows to a certainty when he has found a girl with remarkable dexterity, and can classify her on an exact mathematical basis as to about the work she can do. Whether this girl will make good depends on the factory management. Abe has found her capacity, and it is up to the efficiency man to bring it out in her daily work at the job.

Abe can go a little further, if the factory has no system to get the maximum from the girl's capacity; he has fair means of knowing her conscientiousness, and can usually choose a girl who will work at an honest pace, even if the factory system is such as to be systematically unappreciative. It must be acknowledged, however, that this is placing a hard burden on Abe, and may lead to blaming him for things over which he has little control. Some day Abe will be able to tell you with mathematical precision just how steady and conscientious that girl will be; but although the new science has not gone that far yet, he can estimate fairly closely.

It is well to state here that in our experience with this system we have a basis for believing that such tests as these, and our special written tests, show uncannily the extent and limits of human capacity. We have already arrived at the point where we can pick with rarely failing mathematical precision the right person for the right job, but always it must be remembered our work is only the beginning. Every firm must bring out the capacity that is found.

We have thus far shown certain tests which are nearly always conclusive as to the natural motive and sense qualities of a prospective employee. There are many others on this board which still further show the range of ability. These will be taken up later in a discussion and analysis of the whole range of human characteristics bearing on the labor problem.

Beside the tests as outlined above, written examinations are used in classifying applications for office positions. There is nothing new in this except that attention is being given to setting more definite standards.

As examples of users of this written method we may cite the Curtis Publishing Company of Philadelphia and the National Cloak and Suit Company of New York. The Curtis Publishing Company have also given much attention to the subject of *interior standards* as distinct from *exterior standards.* This nomenclature is a classification which we take the liberty of making ourselves. Interior standards are those which a firm finds among its employees already at work, and have relation distinctly to their production as exemplified in piece work, or in such cases as percentage rating of a salesman's salary to his sales. Exterior standards are those which are made in examinations such as we

have outlined. Both classes of ratings are fields for the application of the new science.

The value of this system is found in the experience of the Curtis Publishing Company. They determined to set an interior standard for typewriting. A preliminary investigation disclosed that their typists were not producing over fourteen words a minute. This is not unusual, although we have found that the average ability of a typist is thirty-eight words a minute under a contest impulse. The Curtis Company proceeded to set a standard, and now their girls are producing twenty-nine words a minute as against the former fourteen. The girls are also better satisfied, since they make an average of $12 a week now as against $8 formerly. One can imagine the vast saving in a large force of typists.

Bookkeeping is also subject to interior standardization, as the Curtis Company has proved. By similar tests they set a standard as to the number of accounts every bookkeeper should handle, with a resultant saving of approximately 50 per cent in this branch of the business.

The application of exterior standard tests to mechanics is capable of securing a very high percentage of surety in classification, but the work is not sufficiently advanced to give workable methods at present, although much will be found herein of indirect application.

CHAPTER II

TESTING THE EXECUTIVE AND THE ADMINISTRATIVE STAFF

Pamphlet tests for thought speed, writing speed, concentration, or recovery from interruption, mathematical speed and accuracy, memory of names and faces, personal opinion or executive decision, terminology, observation (from advertisements), general information, estimating, comprehension, imitation, telegraphy, shorthand, bookkeeping, drawing, routing, freight classification, electricity, patient analytical detail, tact and composition.

OUR attention so far has been focussed chiefly, though not exclusively, upon methods of examining employees in the lower ranks, and in large part upon the standardizing of manual workers. The most interesting observations described in the preceding chapter, probably, were those directed to physical characteristics, muscular control and dexterity, and the automatic reflexes or the personal factors of co-ordination.

Executives and semi-executives naturally are to be measured and graded by a different scale, in which mental characteristics and acquirements are more heavily weighted.

The following pages reproduce a series of tests which not only will pick out the man of great capacity from among any mixed company undergoing the test, but will arrange a staff of men in the approximate position

of their ability when certain weights are assigned according to the nature of the work. Some of the questions may appear extremely unreasonable, but a reasoning man may be known even by his answer to a silly question, and a fool will answer according to his folly. Judgment should be held in abeyance before condemning any of these tests, for no one knows better than the specialists working in this comparatively new field of management science that some of them are of no significance in special kinds of work. They will be more fully explained under the head of special characteristics in the following pages. The most of these tests have been changed in detail from the ones used in actual practice, but they contain the same element in every question by which we find a man's individual rating as compared to other men. As they are here presented they furnish as good tests as those we use, and a person by reading the directions preceding can grade himself as compared to other men. If the reader wishes to test himself, he should have some one else time him in the time tests and should not read any set of timed questions previously. Our reasons for not presenting the same questions used in practice must be obvious, since it would vitiate the determinations of actual and relative standing, in employment-department work where our tests are used, should employees read these questions before an examination. Tests will be given on the left-hand page and explanations on the right-hand page.

STANDARD TESTS
for
TESTING EMPLOYEES

On turning to the next page you will be confronted with twenty of the easiest questions that we could think of. Some one should hold a watch and time you by the second hand. On the word "go," turn the page and write one answer after each question, using a pencil, as fast as you can. At the end of thirty seconds your friend should say "*Stop,*" and you should halt immediately.

Give the name of any vegetable.

Give the name of any metal.

Give the name of any insect.

Give the name of any reptile.

Give the name of any fish.

Give the name of any man.

Give the name of any woman.

Give the name of any ocean.

Give the name of any lake.

Give the name of any town.

What color is water?

What color is tea?

What color is beer?

What color is ivory?

What color is the sky?

What color is grass?

What color is milk?

What color is chalk?

What color is coal?

What color is skin?

Thought Speed

The test on the opposite page shows your relative speed of easy thought compared to that of other men. You will answer from four to fifteen. Human average is approximately eight,* so that if you have answered more than that number you are fast in easy thought, and slower than most men if you have answered fewer. The test is of little significance unless your job requires constant and quick decisions.

*Averages here shown may run slightly different from the tests we use in actual practice, but we do not believe the variance will be very great.

Test on the Next Page

The next test is similar, only that there will be five difficult questions to answer in twenty seconds, as fast as you can. In all of these time tests a pencil should be used, and you should start and stop on signal as described in the foregoing test.

1. Who is the greatest living general?
2. What is the most powerful force in the world?
3. What is the greatest modern discovery?
4. What is the greatest necessity of commerce?
5. What is the cheapest food for the human race?

Thought Speed

The test on the opposite page will show speed of decision on difficult questions. The average on this is three, so that if you answer fewer it shows slowness or deliberation in thought. If you answer more it shows great speed in decision. Wide latitude is allowed in answers, so that none are disqualified unless the answer is entirely irrelevant, such as the name of a man for a country. This test is of significance only on jobs requiring high speed and instantaneous decision. Many high-calibred men will refuse to decide on the data and the time allowed, so that in jobs where there is time for deliberation this test is of no significance.

Test on the Next Page

The succeeding test is a time test, but you may turn immediately to the next page and read directions, and as soon as you can comprehend them give the word to the time-keeper that you are ready.

Writing Speed

At a signal you will be given thirty seconds to write just as fast as you can from copy below:

The German merchant marine at the beginning of the war comprised something over four and a half million tons. The tally of a British shipping authority shows that a million and a half tons have been captured or sunk by the Allies.

Write here:

Concentration

At a signal you will be given one minute to write from copy below, but you will be interrupted every ten seconds to add two easy numbers together. Put the answers to the sums opposite 1, 2, 3, etc., below:*

It is pointed out that Germany was a large exporter of steel before the war, and has since added to her resources in that line by capturing rich iron regions in Belgium and France. The export trade is cut off; and, in spite of the huge consumption of steel in war munitions, there is a big surplus which is said to have gone partly into new merchant ships.

Write here:

(1).....(2).....(3).....(4).....(5).....(6).....

Do Not Turn Any Page Until Told

* The examiner should prepare six problems in addition, each consisting of two figures each whose sum does not exceed 12. He should practice these until he can give them every ten seconds, beginning at five seconds after the start and ending at fifty-five seconds, and stopping the test at sixty seconds.

Writing Speed

The average on this test is the ability to write 76 letters. In actual practice only words are counted and they give the answer sufficiently close. Finger speed seems to be the principal element here. The test is of little significance by itself, but is used as a basis for the following test:

Concentration or Recovery from Interruption

The average on this test is 110 letters. Subtracting the average of the former test from this gives 34, which shows average recovery from interruption. The man who can write 45 extra letters here naturally shows better recovery from interruption than the man who can only write 25 extra. The former is above average and the latter below. In actual practice only extra words are counted. The problems are so easy that few fail in them, but a failure therein would result in subtracting 5 more letters from the record.

Mathematical Speed

In the next test will be found twenty columns of figures to add. Unless you are an expert mathematician it will not be expected that you will get many; but when the signal is given turn quickly to the top of the next sheet and start to add, beginning to your left on the outer edge. Get as many as you can in one minute.

Standard Mathematical Test

6	5	7	3	2	9	6	3	9	2	7	2	8	6	5	9	4	5	8	8
6	2	5	2	5	6	8	6	6	7	6	5	4	5	5	6	7	6	5	6
7	7	4	9	3	2	5	9	5	8	3	4	8	2	8	8	5	7	4	9
7	8	6	8	8	2	4	8	8	8	5	6	6	3	7	7	3	8	3	5
5	6	3	9	8	3	8	6	2	4	2	5	5	2	3	5	8	3	7	6
5	5	2	8	4	2	7	9	3	8	9	3	7	3	2	3	6	3	6	4
4	4	1	6	6	1	3	4	8	7	9	1	3	8	1	3	4	9	7	3
3	7	8	5	3	7	4	7	8	9	3	5	3	7	5	8	2	9	6	7
8	8	3	8	9	8	2	8	6	5	4	9	5	8	6	6	2	2	9	5
4	8	7	7	5	5	1	6	4	3	7	3	8	7	7	1	3	4	2	2

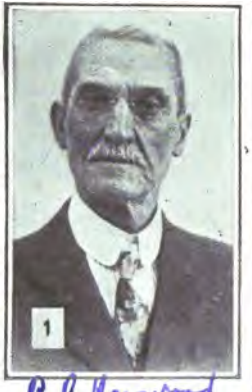
Ordinary human average in this test runs at about four columns, but varies greatly according to the class of people. Office average runs at eight. Some people can only do one, and about one person in a hundred can do all twenty in a minute. The accuracy record for offices is 9 on a basis of 10. This test is very important for routine clerical work, but is not of great significance in other lines.

Test on Next Page

When you look at the next page you will see ten photographs with names attached. You will be given two minutes to memorize the names as connected with the faces. At the end of two minutes you are to turn to the following page where you will find the same faces but in different rotation. Write as many names as you remember on the margins above and below the faces.

Mrs. F. W. Snelling | Joe Haynes | Mrs. C. Wainwright | Wm. N. Smith | Ed. White

James Sanderson | Mrs. Wilson | R. P. Haywood | Clara Brown | E. T. Ellsworth



R. P. Heywood

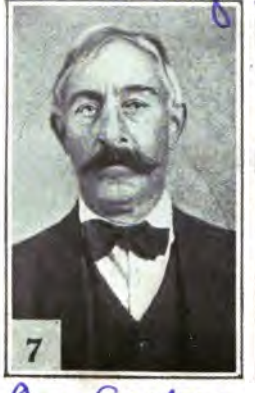
Mrs. Swallow

J. H. Hackney

Wm. N. Smith

Ed White

Clara Brouty



James Sanderson

Mrs Wilson

Mrs. C. Wainwright

Memory of Names and Faces

In marking this test allow one point for every last name remembered, and deduct one-tenth of one point for every initial not attached correctly to the names remembered. The average on this test is 5.4 on a basis of 10. Only about one person in fifty can remember all names and initials correctly. This test has proved of little significance for ordinary clerks or executives; but it is of importance for hotel clerks, waiters, and salesmen.

Following Tests

There is no time limit to the remainder of the tests, so that the person under test can go ahead from this point following further directions as he meets them.

Personal-Opinion Test

(We prefer "Yes" or "No" after "Ans." opposite each question, but comments are allowed.)

Do you believe the following:

1. That war is ever justifiable?....Ans. no
2. That to "love your neighbor as yourself" is a better guide than obeying the ten commandments?....Ans. no
3. That most people are dishonest if pushed hard enough?..Ans. no
4. That government ownership is best if it gives far greater happiness?....Ans. yes
5. That private ownership is best if it gives the greatest happiness?....Ans. yes
6. That moral laws would be necessary if everyone was naturally moral?....Ans. no
7. That women are kinder and more humane than men?....Ans. no
8. That you are above human average in ability?....Ans. yes
9. That you can infallibly tell character by appearance?....Ans. no
10. That the United States gives more personal freedom than any other country?....Ans. yes
11. That the Democrats are morally far below Republicans?..Ans. no
12. That the Republicans are morally far below Democrats?..Ans. no
13. That women are incapable of voting?....Ans. no
14. That women will make better laws than men?....Ans. no
15. That trusts are a great evil?....Ans. no
16. That the account of Jonah and the whale is true?....Ans. no
17. That the majority is always right?....Ans. yes
18. That perseverance will always bring success?....Ans. yes
19. That implicit obedience is the greatest business essential?..Ans. yes
20. That everyone has equal opportunity for success?....Ans. no

Do you believe it can ever be possible to do the following things:

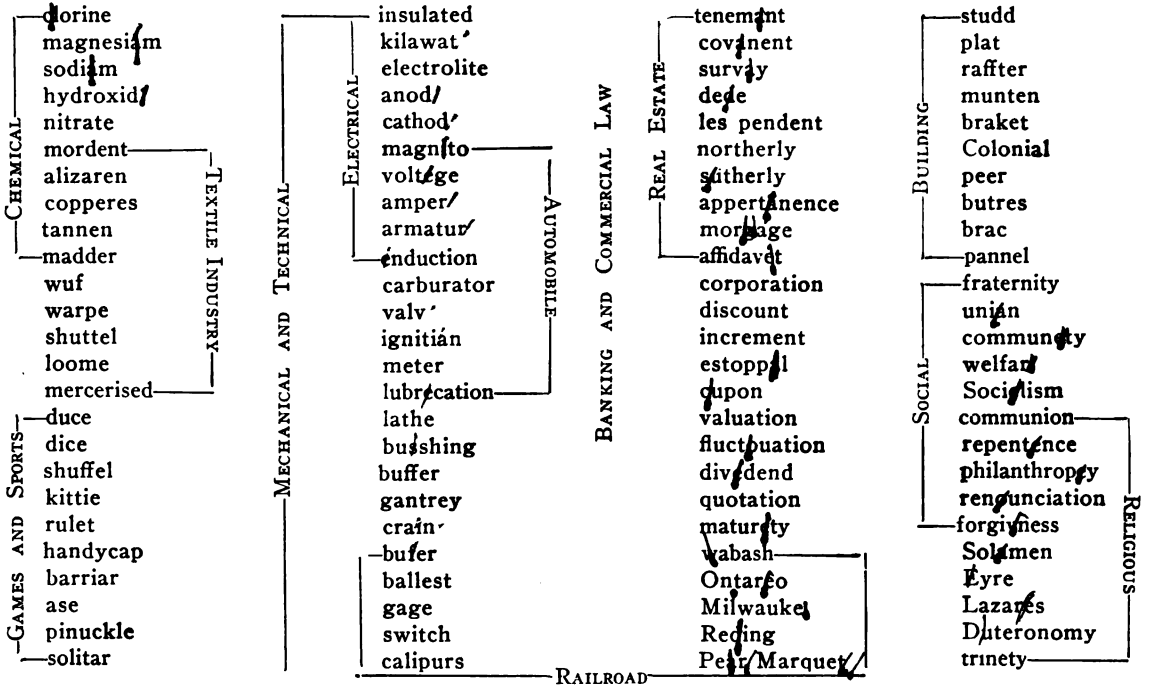
21. To build a tower ten times as high as the Woolworth Building?....Ans. no
22. To furnish wireless power to aeroplanes?....Ans. yes
23. To foretell with 98 per cent accuracy what a man can do by mental and physical tests?....Ans. no
24. To transmute gold from baser metals?....Ans. no
25. To invent perpetual motion?....Ans. no
26. To invent good wave motors?....Ans. no
27. To invent good tide motors or machines run by the tides?..Ans. yes
28. To invent good sun motors?....Ans. no
29. To tunnel from Alaska to Asia?....Ans. no
30. To find an old age cure?....Ans. no

Personal-Opinion Test

This test is of great importance since it classifies people very distinctly according to their mental calibre. The answers to the questions should be determined by the vote of ten very high-class executives. We have determined them for our own use by the vote of twelve such men as Edison and Harrington Emerson; thus the answers of a person will show his correspondence to minds of certain type. By this method we have found human average to be 41. In a class of twenty typists seeking work not one made over 57. General executives average 73. Only one man has made the 100 per cent maximum.

Terminology Test

In the following list some of the words are spelled wrong. Cross out any letters that are wrongly placed in a word: That is, if you were marking vaze, when vase was intended, draw a line through the letter wrongly used. If letters are omitted, as in char for chair, or prov for prove, mark thus, cha/r and prov/, placing a line where the missing letter should be. You do not have to show how they are spelled. Simply cross out misplaced letters or mark where they are omitted. If you do not understand what the words are, look on the side and you will find words telling in what kind of business they are used. If you do not understand then, pass it, for you will not be expected to know all the words in this list.



TERMINOLOGY LIST

Terminology Test

A terminology test will show the class of words with which a subject is acquainted. It furnishes a side test on spelling. Average ability in this consists in getting 86 words right. It furnishes a good test for stenographers, type-setters, and editorial workers. Special lists can be arranged covering the technical words of a particular business, and this will also give some rating on trade knowledge. Correct spelling can be verified by reference to a dictionary.

OBSERVATION TEST

Observation Test

In the blank space below set down the numbers of the advertisements opposite and tell what special product is advertised by each.

Average ability in this consists in getting nine of the twenty-five advertisements shown. It will vary with different sections of the country, and the classes of subjects. It has not proved of great significance in any vocation we have examined. It should show to some extent the type of memory and commercial instinct.

General Information

We would like to know your general knowledge of things. Kindly answer the following questions if you can:

1. Of what is mortar made? Give proportions if you know them.
2. Of what is glass made?
3. Of what is sugar made?
4. Of what are bricks made?
5. Of what is ink made?
6. About what is the present price of cement per barrel?
7. About what is the present price of sugar per barrel?
8. About what is the present price per ton of bituminous coal?
9. About what is the present price per pound of copper?
10. About what is the present price per pound of spelter?
11. Translate into all the languages you know: "Every dog has his day."

(The examiner can here insert four oral questions if desired.)

Average human ability in this test consists in answering three questions correctly out of ten. Office average will run as high as five. Strong executives usually make from eight to nine and one-half. This is a very important test. The mediocre mind and the high-class executive or commercial type can usually be classified very distinctly by its use, since it is impossible for the man without strong commercial and useful instincts to answer these questions. An answer which is 70 per cent correct is given full rating. If 50 per cent correct, it is given half rating, and if less than 50 per cent it is thrown out. This test cannot be used alone to classify executives, but must be combined with others to make a dependable record.

Estimating

1. About how many sheets of paper would there be in a pile one inch high if each sheet was the same thickness as this sheet?

2. Put points on the following lines as directed. Read above the lines for directions.

Set 2 points 1-8 inch apart.

Set 2 points 1-3 inch apart.

Set points 1 inch apart.

Divide this line in two.

Divide this in three parts.

Divide this in 4 parts.

3. Put the points on the line below in the same positions as the points on line over Question 1.

4. About how much bituminous coal of average grade would an ordinary freight train engine burn in an hour's run of thirty miles, hauling 40 cars on level grade?

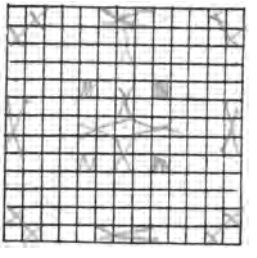
5. About how fast can a sparrow fly?

Estimating Test

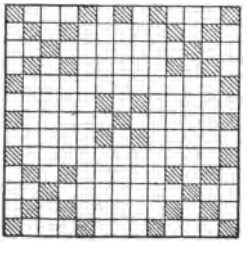
Human average in this is 22, allowing 5 points for questions 1, 4, and 5, and allowing 1 point for every mark correctly placed on the lines. This is a combination of various estimating qualities, and to be accurate should be fuller and divided into classes. It is an important test for mechanics, builders, engineers, draftsmen, buyers, and for many lines of work.

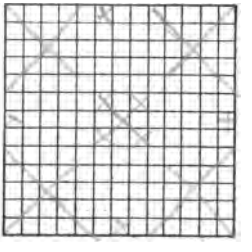
Comprehension and Imitation

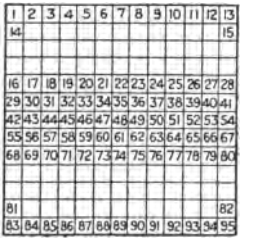
In the pattern below, black in the little squares on each side of each corner by making cross markings with the pencil. Then locate the little square at the centre of all the squares. Let this be blank but make a Greek cross around it by filling in each two adjacent squares above and below it and on each side. Then fill in the three middle squares half way between the two outer corner squares on every side. Then fill in the four squares where the fifth rows of squares from each corner cross.



In the second square below copy the design of the first square.







Comprehension Test

Human average in this is about five on a basis of ten. It is extremely important in all lines of work. Few executives realize how much loss is incurred by failure of employees to understand directions. This is one of the combinations of ratings to determine a first-class executive. The right solution can be found by referring to the last of the four square patterns shown, in which some of the smaller squares are numbered, and blacking in the numbered ones as follows: 2, 6, 7, 8, 12, 14, 15, 20, 22, 24, 29, 35, 41, 42, 46, 47, 49, 50, 54, 55, 61, 67, 72, 74, 76, 81, 82, 84, 88, 89, 90, and 94. This problem is purposely somewhat vague. It can be reversed and made a comprehensibility test by an executive making a design of his own and attempting to explain it in words as we have done above. Any executive who could present a blank set of squares and have five people out of ten interpret a design correctly, such as shown in the second pattern, has wonderful clarity of expression. It will be a revelation to most executives of their inability to put their thoughts clearly. Out of 100 attempts at solving such a problem as the above, we have received 75 different interpretations, many of them very weird and ingenious.

Imitation Test

If a person cannot understand language there is still a chance if he can imitate, and hence these tests go together. Most people can copy the pattern shown correctly, but there are a surprising number who fail even here. Both of these tests are important in all work involving comprehension of instructions, or imitation.

Trade Tests

From here on various trade questions and examples requiring trade knowledge will be given. Kindly read them all over and if you can answer anything on each question please do so, as positions may be open where some knowledge of these may be useful. If the question is meaningless to you pass it quickly and do not waste time on it, as it is not expected that you shall know it if you have no acquaintance in that trade.

Telegraph Operator

1. Give the telegraphic code for "I will return on first train."
2. (Let the examiner give code message here if desired.)

Shorthand Writing *

1. Write the following in shorthand: "We appreciate your kindness."

2. (Let examiner dictate some shorthand here if desired.)

Telegraphy Test

No average has been compiled on this. Telegraphy speed and accuracy records can be taken by submitting copy and forming averages on the number of accurate words written in five minutes.

* A complete stenographic test is treated in the Appendix.

Bookkeeping Test

Kindly enter up in the proper blanks below the following items. The B. & O. Railroad buys on March 1, 1916, as follows: 1,000 tons of rails from the Bethlehem Steel Company at $30.00; 10,000 feet of No. 2 N. C. Pine from Jackson & Co., at $15.00 per M.; and pays Bethlehem Steel Company $82,000. Balance the Steel Company account.

Journal P. 102

Date		Dr.	Cr.

Cash Book P. 105

Date		Dr.	Cr.

Ledger

Bethlehem Steel Co.

Date		Dr.	Cr.
	Carried		52 000 00

Jackson & Co.

Date		Dr.	Cr.

Date			

Date			

Bookkeeping Test

Bookkeeping seems to be an unknown art. Only about one person in a hundred can make these entries correctly, and few even attempt it so that it is useless to compute a human average. The test requires ten entries and one point is allowed for each entry. Unless the test is for bookkeepers, record is made from this simply of the subject's side knowledge therein for useful reference. Bookkeepers seem to be so specialized that few even of those who call themselves by this name can do this problem.

Mechanical Drawing

1. Simply sketch in a plan, end elevation, and side view, of a bookcase with 3 shelves, 1 ft. deep, 2 ft. wide, and 4 ft. high. Assume any scale to fit in space above, and figure it. Since you have no scale, inexactness in dimensions will not be rated if relative sizes are shown.

2. (The examiner can give a problem here if desired.)

This is simply a side reference test with no general average. It is useful as a record where employees should occasionally be able to sketch up their own ideas, or understand drawings.

Routing and Freight-Classification Tests for Shipping or Railway Clerk

1. How would you route a packing case by freight between the following points:
   a. New York to St. Louis.
   b. Boston to Akron.
   c. Portland, Me., to Chicago.
   d. Butte to Savannah.
   e. Savannah to Dallas.

(Let examiner insert ten towns below if desired.)

f. ..... and .....
g. ..... and .....
h. ..... and .....
i. ..... and .....
j. ..... and .....

2. How would you classify the following articles from 1st to 6th class?

a. A case of library books
b. A car of iron pipe.
c. A car of fruit.
d. A car of paper pulp.

(Let examiner give out orally four classes of articles for spaces below.)

e. .....
f. .....
g. .....
h. .....

Routing Test

The average on this for seventy-one railroad men is a trifle less than four on a basis of ten. It is only just to say that few of them had any work where they could acquire the knowledge or where it was essential. Wide latitude was allowed in answers so long as they got actual connecting lines. This test is important for shipping clerks, forwarding agents, and in many departments of railroad work.

Freight Classification Test

The average on this is two on a basis of ten for the same number of men and conditions as above, and with corresponding application.

CHEMISTRY

1. Give the formulæ for the following as near as you know them:
   a. Alcohol ..... b. Carbonic acid .....
   c. Salt ..... d. Gasoline .....
   (The examiner can here ask formulæ specially applying to job.)

ELECTRICITY

1. If two cities 100 miles apart had a telegraph system keeping 100 operators busy at each end, how many wires would it take?
2. What substances are usually used in batteries?
3. How would 500 horsepower be expressed electrically?
   If a waterfall developed the above power:
   a. How many 40-watt lights could it take care of?
   b. What kind of dynamo would you advise?
   c. How many feet of wire would it take to wind the dynamo of any size you specify?
   d. About how many bars should there be in the commutator, assuming your own conditions?
   (The examiner can here give two questions with special application to the job.)

No average has been compiled on these technical tests, since they are used simply as a side reference for knowledge that some job might require.

PATIENT ANALYTICAL DETAIL

The average on this test varies greatly with the class of people. Human average runs below two on a basis of ten, and an office force that can make three is fairly high in class. The ten problems given on the following page are very carefully chosen and worded to cover a number of qualities, and the test is of extreme importance. It takes a high-grade man to get six, and the maximum of nine and one-half has been attained by only a very few of the most efficient men in the country. The problems must be done at one sitting with no references or outside help. There are so many points of detail involved that few minds have the patience to heed them all, and many merely patient minds fail on the reasoning and analytical elements. Considerable business knowledge is also involved.

Patient Analytical Detail

1. A shipping clerk finds that his force is packing only two cars a day and making $6 thereby. He offers them a bonus of $1 for every car they can pack above their former record. They make $9 a day under the new incentive. What is the total number of cars they pack?

2. A workman lost from Monday to Friday, inclusive, of the last week in February, 1914, the month commencing on Sunday. How many working days did he make for the month, excluding Sundays and legal holidays?

3. If the year 1914 had been a leap year how many days would the workman have made in the above example?

4. A sheet-metal worker cuts as many diamond-shaped pieces as possible out of a sheet of copper 20 by 20 inches. The extreme length of the pattern is 10 inches and the width 5 inches from point to point. How many square inches of waste has he left?

5. A mail-order house finds it costs them to deliver a certain package as follows:

25 cents to Maine towns,
20 cents to Connecticut towns,
30 cents to Pennsylvania towns,
35 cents to Virginia towns,
40 cents to Ohio towns.

They sent three of these packages, one to Harrisburg, one to Cleveland, and one to New Haven. What was the total cost of delivery for the three?

6. A speculator bought as follows: 100 Pa.; 300 U. P.; 300 U. S. S.; and 100 U. S. S. pf. A bear market moved the "industrials" one point, and he sold them out. How much did he make or lose on them, including ⅛ commission both ways, but excluding taxes and interest?

7. A lumberman turns the following rough timber into finished product: 200,000 square feet of oak; 400,000 square feet of white pine; and 300,000 square feet of cedar. He wastes ¼ in making siding, 2/3 in making shingles, and ½ in making flooring. How much total finished product in square feet did he get out of each?

8. An efficiency expert takes the time of a workman. He finds that two hours are spent in setting up his machine with ½ lost motion. Eight hours are spent in producing eight pieces with ¼ lost motion. Provided these observations are correct, how many pieces should be produced in a ten-hour day with the lost motion eliminated?

9. A small town wishes to pave the streets of its business section. The main street running north and south is 100 feet wide with a 20-foot sidewalk on each side, and is to be paved for 1200 feet, excluding sidewalks. Five side streets are to be paved from the first street east to the first street west of the main street, the distance between these east and west streets being 700 feet, and the width of the paved section 30 feet. The job cost them $1 a square yard, with $1 extra for running yard of the gutters. What was the total cost?

10. Six machines each produce 100 pieces a minute. Ten packers take care of the total product, half of whom handle twice as many pieces as the other half. How many pieces per minute do each of the less efficient workers average?

Tact and Composition *

Suppose you were private secretary to a banker named William Roe. One of the depositors, named Mrs. F. Jones, writes asking a donation for her favorite charity. Mr. Roe tells you to write a letter refusing. Kindly write the letter you would compose (in space below).

. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .

Tact and Composition Test

In this test there is considerable latitude for an examiner's judgment, which is a dangerous element for any test system. The former tests have been self-determining and not open to much choice of rating. We have compiled averages in this, but we consider them worthless in scientific value because of our own fallibility element; but the test itself is valuable in a positive and negative way, since an employer can very readily determine from several letters of this nature whether or not an employee can be trusted to correspondence work. A good proportion of the answers we received would either estrange the customer or wreck the bank.

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* Copies of these Standard Tests, differently worded, in pamphlet form, can be secured at $10 per 100, from "The Engineering Magazine," 140 Nassau Street, New York. This privilege is extended to employers only, and not for retail trade or individuals.

Entries from these tests are made in various ways:

1. Executives can be furnished with a complete handy reference list of their department similar to the chart just below, from which they can pick men especially fitted for particular assignments.

EXECUTIVES	Easy Mind Speed	Ethical Speed	Hard Mind Speed	Writing Speed	Concentration I.	Adding Speed	Accuracy Speed	Memory Names	Common Sense	Gen'l. Information	Estimating	Comprehension	Bookkeeping	Drawing	Routing	Classfication	Chemistry	Analysis	Written Tact	Composition
C. D.	10	5	3	13	11	15	10	5.7	77	8	27	6		7	10	5	2	4	9	9
A. E.	8	5	5	16	12	17	10	6.1	80	3	29	10		3				1	10	10
W. C.	10	5	4	13	15	13	10	5.	77	4.5	26	5.5			2			3.5	10	10
H. C.		5	5	17	11	13	10	8.8	60	6.	23	5.			4	3		3.5	9	10
F. M.	9	5	4	11	10	13	10	7.9	70	5.	7	7.	7					1.	9	10
R. K.	10	5	4	12	11	10	9	1.6	53	4.	21	10.						1.5	10	10
J. Y.	8	2	4	13	6	11	9	6.	80	3.	14	6.5			5			1.5	9	9
S. F.	8	3	2	11	17	10	10	5.4	67	4.	21	6.	5					1.	9	10
E. S.	9	5	3	14	8	16	10	4.6	63	4.5	27	5.			1			1.	9	10
R. E.	7	4	3	14	9	13	9		70	6.	19	1.						1.	10	10
Class Average	9	4.4	3.7	13.4	11	13.1	9.7	5.1	69.7	4.8	21.4	6.8	1.2	1	2.2	.8	.7	1.9	94	9.8
Gen. Office Average	8	4.	3.		13	8	9.	5.2	58	5.1	22	5.8			7.	3.0		3.0	7.	8.

RELATIVE ABILITY CHART OF AN EXECUTIVE AND TEN CLERKS

The chart on page 49 shows how the relative ability of an executive and his staff can be shown graphically. In the ten clerks analyzed we do not consider that any show enough capacity to make a good executive, although one man will make a fair semi-executive. In compiling such a chart the tests which are the most significant are given the greatest weight, while others showing little applicability to the work, are not rated at all. Below the graphic presentation is shown a short analysis of each man, and his rates can be compared with the class average and general office average shown at the bottom. It will be seen that a man failing to make a high general average may be specially adapted to particular work, clerk E. S., for instance, being a wonder in adding speed, making sixteen, or three above his class average. He is also a very fine estimator. A chart like this furnishes a handy reference for an executive in assigning work.

2. The ratings are filled in on the characteristic chart (see folded insert), together with observations on the subject's personal qualities. This card furnishes a complete analysis of the employee, and the reverse side can be used to keep a continuous record of his efficiency.

How to Use the Card-Index Chart

The chart (folded insert) is to be used in recording the characteristics of employees. Usually only the essentials for their particular job—possibly between 10 and 20—are entered; but it is well to get as full a record as practicable. If the observational method is used, simply underscore all the characteristics observed. If the test method is used, the results of the examination are entered after each characteristic, and in some cases general averages computed therefrom for the general characteristics noted at the top of each square. Many of these records are filled in from employment blanks. Hand and finger measurements can be recorded directly on the hand shown at the bottom, and if the fingers tend to line up straight, the dotted

lines showing the nearest approach to true shape are filled in. The outlines of the face and features are recorded by filling in the dotted lines in the composite pictures which most nearly conform to the subject observed. Character lines are likewise solidly filled in. Round, square, and angular-featured types, or composites thereof, will thus be distinctly classified. Where bodily measurements are taken, records are entered upon the figure to the right. The most vital traits and summations thereof are entered in the top spaces, which are intended to be exposed in any exposed file system.

In the last two chapters now concluded, the reader, with some special vocation in mind, may fail to see the value of certain tests. As a matter of fact, it is not unusual to find that less than a quarter of the tests tried are really significant, so the reader is probably 75 per cent correct in his judgment; but we have a definite law, to be given later, called the *Law of Extremes,* by which we exclude useless tests, and those left prove of such value that it is a common experience to compile a chart of relative ratings such as that shown on page 49 to which, practically, no exception can be taken. These charts are compiled only from the practical tests, and their average may form a standard basis for new employees or for advancement. In the one shown only about 25 per cent of the tests given in this chapter proved of value. The same may be said of the success of match-board tests, but the few successful tests are very significant and valuable. We cannot yet claim uniform success in rating all workers, for sometimes our analysis is wrong or there are too few on a special job to get dependable averages; but such failure is only temporary, for the constant hammering of the standardizer is gradually working out the correct analysis of the human element.

Chapter III

EMPLOYMENT BLANKS

The employment blank provides a means for securing records of nationality, family environment, experience, interests, life history, economy, tastes, and general mental make-up. These are important data for determining personality and special capacity, as will be shown in later chapters.

THE employment blank may be considered to be the beginning of the science of the "Standardization of Labor." It has been in use from unrecorded time, and has gradually reached a state of high scientific value. While few have attempted to use it in a purely scientific manner, yet the revelation of character as depicted in the filling of one of these modern sheets is such that, as one expert told us, he "can tell very closely what kind of a make-up a person has without ever seeing him." The Kelly-Springfield Tire Company, the National Lamp Works, and the Retail Credit Company all have what might be called psychological question sheets, covering not only the usual employment-blank questions, but personal queries relating to social records, health, preferences, ambition, literary tastes, economic ability, and egotism or self-judgment. The Retail Credit Company makes personal estimate ratings in connection with this employment blank on appearance, age, weight, height, eyes, hair, handshake, peculiarities, health, education, temperament, attitude,

adaptability, efficiency, outside influence, and financial condition. The National Lamp Works includes in its employment blank the expert's "impressions," rated from one to three on approach, personality, refinement, affability, physical balance, clearness, quickness, breadth of imagination, reasonableness, judgment, tact, decision, scholarship, honesty, and health.

On following pages will be found the text of the blank which we have prepared, but more complete than we have yet used. It has been compiled from many sources. It is in part directly designed by us to get data on particular points in our chart. Some of the questions come from a set we used on applicants in the Underwood Employment Department, in a test we made through the courtesy of Mr. Meinecke of that company. Others are taken from a collection of employment blanks in our files including, besides the companies mentioned above: the Equitable Life Assurance Society, the Interborough Rapid Transit Company, the National Cloak and Suit Company, the New York Telephone Company, the Ford Motor Company and the Fidelity and Casualty Company of New York. The Interborough Rapid Transit Company and the Equitable Life have very thorough physical examination records attached to their employment blanks, and we have used these as a basis for our health classifications on the chart, together with the valuable data of Prof. Geo. L. Meylan, compiled for physical tests on Columbia students. We do not attach health tests to this employment blank as the point is covered on our card-index chart. The Employment-Blank text as copied here is compressed to octavo page size. In practice a large page (about 8 by 10½) is used to afford more room for written entries.

Employment Blank

We wish to know everything possible about you in order that we may do you no injustice. If some of these questions are too personal you are free to leave them blank, but we wish as many answered as possible, for each question gives us some insight into your character and will help in placing you right.

Name in full?.....
Address? .....
Telephone No.?.....
How long have you lived there?.....
What position and wages do you want?.....
Date of your birth?.....Where born?.....Sex?.....
Name of father and where born?.....
What was father's business?.....Where was mother born? .....
Are your mother and father living, and if not how old were they when they died?.....
Who brought you up?.....
Did you spend your childhood in the city or in the country? .....
How far did you go through school?.....
Give the names of schools and colleges you graduated from. .....
What educational courses are you now taking?.....
Are you naturalized?.....If foreign born, how long have you lived in the United States?.....
Are you married?.....divorced?.....separated?.....
Are you a widow?.....widower?.....
How many children have you?.....How many people, including children and relatives, depend upon you for support? .....

Do you own your own home?.....live with your wife or husband?.....with your parents?.....live in a flat? .....board? .....

Give particulars below of former employment, beginning with last job and going backward, as fully as you can remember.

Name and Address of firm who employed you	What positions held	Wages	Date you began	Date you left	Why did you leave..
Name.....					
Address.....					
Name.....					
Address.....					
Name.....					
Address.....					
Name.....					
Address.....					

Have you mentioned all the firms for which you have worked? .....

Underscore the firm you liked best. Why?.....

In which of these jobs are you at your best?.....

If employed now, state where and reason for change.....

Give below a short history of your life.....

.....

.....

.....

.....

.....

.....

.....

We wish all employees to be free from financial strain, if possible, and would desire that all be very confidential with our employment manager in this respect. In some cases where employees are pressed for illegal claims we will give them legal assistance if they confide in us. In order that we may know your needs and habits of economy give us the information listed below. (Remember you are free to leave these questions unanswered if you think them too personal.)

	Income	Outgo
What monthly income have you from your property?		
What monthly income have you from boarders or otherwise?		
What monthly income do others of family bring in?		
What is your total monthly income outside your wages?		
How much does life insurance cost you reckoned monthly?		
How much do society fees cost you reckoned monthly?		
How much do installment fees cost you reckoned monthly?		
How much does your rent cost you reckoned monthly?		
How much does your board cost you reckoned monthly?		
How much do building association fees cost you reckoned monthly?		
How much does gas and light cost you reckoned monthly?		
How much does coal cost you reckoned monthly?		
How much does food and clothing cost you reckoned monthly?		
How much do luxuries cost you reckoned monthly?		
What is your total fixed outgo?		

	Property Value	Debts
What is the value of your personal property and furniture?.....		
How much do you owe on them?.....		
How much do you owe on notes?.....		
How much do you owe on judgments?.		
How much do you owe otherwise, unsecured?		
Do you own lots? Ans..... What is their value?.....		
Where are they? What mortgage on them?		
If you own houses what is their value?..		
Where are they? What mortgages on them?		
What stocks do you own and value?....		
How much endowment insurance do you carry?		
When is it due to you?.....		
How much other life insurance do you carry?		
How much have you borrowed on life insurance not listed before?.....		
How many building association shares do you carry?		
How much have you paid thereeon?...		
In what banks do you deposit and how much? Bank?		
What do you own not listed above and what is value?.....		
What do you owe not listed above and what is value?.....		
What is the total value of all you own?..		
What is the total amount of all the debts you owe?.....		

Is anything listed above in your wife's or husband's name, and how much?..		
What is the total value of your wife's or husband's assets not listed above?...		
If ever in business for yourself what is the most you made yearly?.....		
If ever in business for yourself what is the most you lost?.....		

Have you ever bought oil or mining stocks?.....
How much did you lose on them?.....
Have you ever been in bankruptcy?.....
What is the most you ever saved?.....
Do you know of any reason why a bonding company might refuse to bond you?.....
What is the principal thing you want to do in life?.....
If you won $1,000 in a contest how would you spend it?.....
.....
What have you invented?.....
What patent claims have you secured?.....
Give the names of any church, societies, clubs, or unions to which you belong, with any offices you hold therein.....
.....
.....
.....
In what religion were you brought up?.....Do you believe in it now?.....
What languages do you speak?.....
What languages do you read?.....
What kinds of sickness have you had in the last five years?
.....
Are you healthy now?.....Have you any headaches?.....
Eye trouble?.....Toothache?.....Rheumatism?.....
Stomach Trouble?.....
Who is your political leader?.....
Do you drink beer?.....Drink whiskey?.....Smoke?
.....Swear?.....Use slang?.....Ever gamble?
.....Would you lie to protect a friend?.....Are you a total abstainer?.....

Underscore the things in the following lists you *like* or *can do,* and put a double line under the things you *especially like.* Put three lines under the things you *can do* especially well.

Games and Sports—Checkers? chess? pinochle? poker? whist? solitaire? football? baseball? polo? golf? tennis? cricket? bowling? pool? billiards? shooting? shuffle board? horse riding? horse driving? horse racing? motor boating? automobiling? dancing? singing? swimming? skating? bicycling?

Studies—Botany? mathematics? history? authorship? chemistry? physics? philosophy? psychology?

Favorite authors—The Duchess? Libby? McCutcheon? Doyle? Chambers? Scott? Dickens? Phillips? Browning? Shaw? Longfellow?

Instruments you play—Piano? violin? banjo? cornet? flute? trombone? fife? drum? mouth organ?

Arts you practice—Drawing? drafting? painting? modeling? designing? millinery design?

Mechanical ability—Can use: wood tools? plumbing tools? machinist tools? fix an auto? run an engine?

Domestic arts—Can cook? nurse? build a fire? hitch a horse? sew? crochet? knit?

Machine operating—Can operate a typewriter? (What make? .....) tabulating machine? (What make?..... .....) adding machine? (What make?.....) sewing machine? elevator? silk loom? carpet loom? lathe? telephone board? What other kinds of machines?.....

.....

Miscellaneous—Can make a speech? row a boat? sail a boat? keep books? boss a gang of men or women?

Things you like—Cats? dogs? horses? nature? travel? gardening? social life? lots of friends? church? cards? sports? to stay home? business life? to make money? art? science? reading? automobiling? fine eating?

In the following lists *cross out* the things you do not believe in, and *underscore* the things you believe in, putting *two lines* under the things you believe in *very strongly*. Put a question mark after words or phrases you do not understand.

I believe in—The Democratic party, Republican party, Independent party, Progressives, Labor party, prohibition, socialism, anarchy, the initiative, referendum, recall of judges, high tariff, low tariff, free trade, woman suffrage, popular election of senators, peace at any cost, strong restriction of immigration, government ownership, compulsory education, old age pensions, alimony even without children, easy divorce, vice crusades, Sunday blue laws, the death sentence, more laws, less laws, eugenics, reincarnation, Christian Science, Christianity, hell, heaven, the devil, Jonah and the whale; in charms, palmistry, vivisection; in unions, trusts, and in government regulation of—private wages, newspapers, plays, marriages, and amusements.

I believe that—Unquestioning obedience is the *greatest* business essential, perseverance *always* brings success, every one has equal opportunities for success, women are very much kinder and better than men, women will make better laws than men, the United States gives more liberty than any other country, the majority is always right, and that I, personally, am always right in my decisions and am above average in ability.

As will be seen, an employment blank of this nature will enable us to estimate quite closely at the start the kind of person with whom we have to deal, and it will furnish specific data upon which we can rate a number of qualities, as will be shown later. Where the applicant has sufficient intelligence to fill it out himself it is a very inexpensive test, and the standardizer can judge immediately whether it will pay to take up the more expensive mental and physical examinations.

Where applicants are incapable of filling the blanks, the standardizer or interpreters have to ask the questions and fill in the data. The Ford Motor Company use the latter method almost entirely, though, of course, it entails some additional expense. The willingness or unwillingness of employees to submit to each question depends upon their own independence and the wage or time inducement offered. Some plants are so popular that men would consent to have a finger chopped off if it were a necessary qualification for entrance. Since the subject is allowed to leave questions unanswered if he considers them too personal, his total refusal will usually show that he is of such an independent type that he would not stay long with any firm, and consequently the cost of training him would be wasted money. This, however, is not always the case, and a valuable man may be lost by insisting on these answers. The experienced standardizer knows when to use discretion and adapt his tests to the mental type.

By the use of physiognomy observations and the data of this employment blank, much of the preliminary work of standardizing is done, leaving the pick of the applicants for the more accurate tests.

PART II

MENTAL AND PHYSICAL CAPACITY

Chapter IV

PERSONALITY

The scientific and philosophic basis for the analysis of character. Mental and physical bases of personality. Memory as the foundation of character. Development of selfishness, egotism, and will from memory. Sources of memory. Experience and hearsay. Physical classifications, heredity. Forces of character. Qualities arising from mental and physical make-up.

THE study of personality, which is at the basis of the standardizing of labor, is a science in so far as we can deduce certain rules that work with the precision of mathematics. It is a philosophy in so far as we theorize on the results of the working of certain characteristics and cannot yet reduce them to definite mathematical rules.

As a science we can now lay down a number of definite laws. As a philosophy it is yet beset with uncertainties, which make an effort to diagram personality not conclusive. However, the difficulties of finding how a person will react with a certain set of given characteristics are philosophical rather than practical; for we can already analyze men and women and know how they will react, with approximately 90 per cent accuracy; and this is of immense importance to the business world. The mysteries of character are much

over-rated, and if one becomes accustomed to using the tests with which we have worked, the human mind will lie open with a bareness which almost embarrasses the examiner when he looks within. This feeling comes not so much from what we find as from the violation of the secrecy with which people have enshrouded their individuality; for it has almost become an unwritten law that a man has a right to hide his faults from an employer, and our methods usually lay open the inner recesses both of mental and physical make-up and activity. For this reason our excuse must be a valid one to warrant us in this research into the mind of the employee, and we believe that the justification is, indeed, ample; for while the employer is benefitted, the great good eventually comes to the one employed, for he can undoubtedly make from 25 per cent to 100 per cent more money if he is placed at a job for which he is especially fitted.

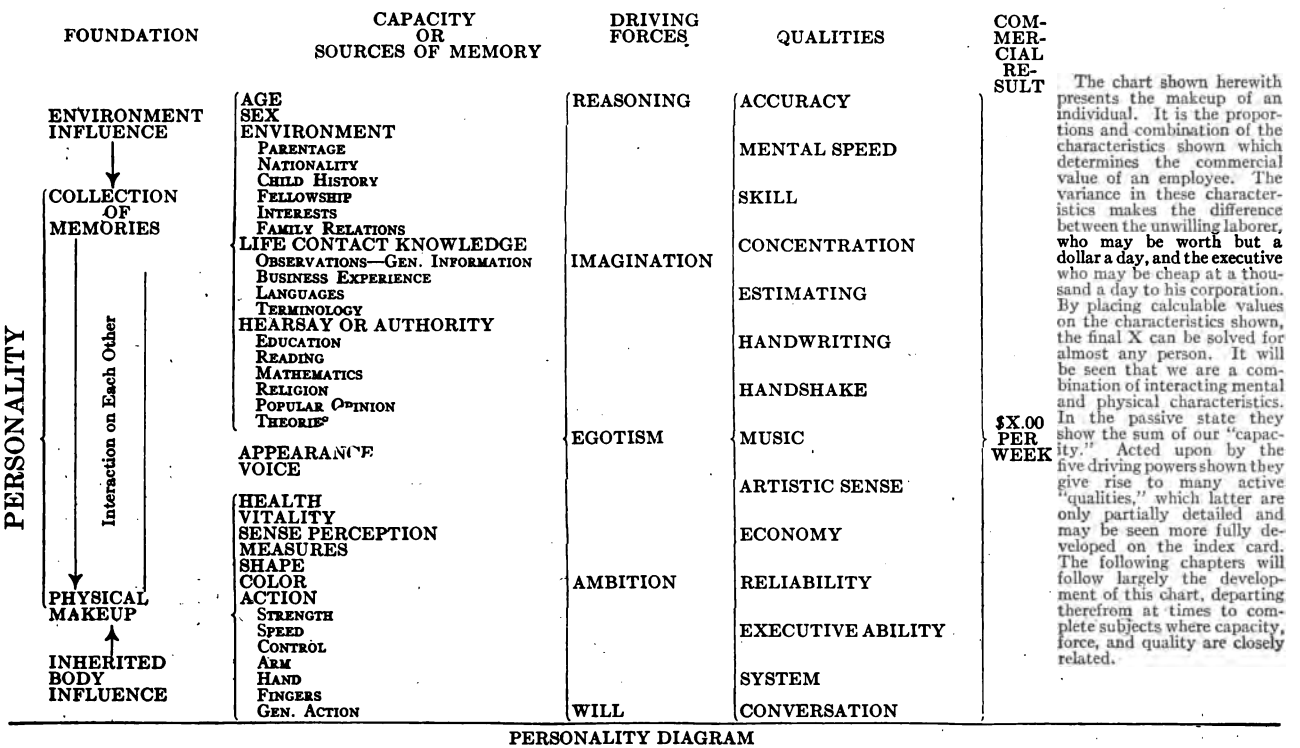
It is largely a matter of surmise, but probably 75 per cent of all persons are unfitted for the first work they tackle. Hard experience and the survival of the fittest probably reduce this to about 40 per cent of misfits in the present business world; and if we can reduce this still further to only 10 per cent, we consider that both the business man and the employee are going to reap an immense benefit. The question is often asked, what are we going to do with the incompetents? But we have yet to find a person who is not fitted for something. An analysis usually reveals one or two traits in which even the so-called incompetents can go above the average of their fellows.

In this chapter we shall endeavor to sketch in the philosophic basis, and in the succeeding one give a sure scientific foundation.

The diagram here shown (see Personality Diagram, page 68) portrays an analysis of personality, and it must be acknowledged that if exact ratings can be assigned to all the characteristics portrayed, we shall know the person with whom we have to deal fairly well. Nearly every one of the characteristics is capable of subdivision into a number of minor traits, and by the time we are through we have fairly well covered the gamut of human possibilities. However, in practical application of the system it is usually not necessary to make an examination in such detail as shown, for the essentials of any particular job under consideration can be rated often with fewer than ten tests.

Both philosophers and scientists may find fault with this analysis of personality, and no doubt can advance perfectly just reasons for other classification. The terms used are popular growths of language and have been necessarily loosely defined, so that nearly every person will assign them a different shade of meaning and thus the diagram may appear to be a very different analysis to various people. Like the old vaudeville joke of shady interpretation, I may well turn to my audience when they laugh and indignantly declare that I do not mean the same thing that they mean.

Although the diagram may appear somewhat complicated, the growth of this science will no doubt show that it is not complex enough; so we will be perfectly frank and acknowledge that our portrayal of personality is as yet only a theoretical hypothesis with little scientific foundation that we can prove. Further, in our enlargement of the subjects shown we should like to reserve the privilege of being inconsistent at times, like the late Elbert Hubbard, for continuity often will demand the finishing up of a subject out of its order.



PERSONALITY DIAGRAM

An attempt is made here to show what makes up an individual. These characteristics when subdivided will form over 300 ratable variances of personality.

The chart shown herewith presents the makeup of an individual. It is the proportions and combination of the characteristics shown which determines the commercial value of an employee. The variance in these characteristics makes the difference between the unwilling laborer, who may be worth but a dollar a day, and the executive who may be cheap at a thousand a day to his corporation. By placing calculable values on the characteristics shown, the final X can be solved for almost any person. It will be seen that we are a combination of interacting mental and physical characteristics. In the passive state they show the sum of our "capacity." Acted upon by the five driving powers shown they give rise to many active "qualities," which latter are only partially detailed and may be seen more fully developed on the index card. The following chapters will follow largely the development of this chart, departing therefrom at times to complete subjects where capacity, force, and quality are closely related.

Personality, we believe, consists of a collection of memories interacting with a physical make-up. If you will observe the conversation of almost any person it will be found to consist of a fund of recollections of what they have done, observed, or seen others do; and if reference is made to what they expect to do, these references are based on facts of memory of what has been done by someone. The conversation of one person consists of pleasant memories of past feasts, showing a sensual make-up. Another will regale you with his wonderful achievements, revealing egotism. A third thinks you will be intensely interested in what has happened to his or her interior mechanism, revealing the hypochondriac. It is their differing recollections which make these different mental make-ups. The thing which makes *you* differ from *me* is a bunch of memories and the physical make-up that goes with it. You may say that ambition, will, and egotism lie at the foundation of what we are; but, in my mind, these are resultant forces based on the facts of our memory backed by our physical health and condition. With imagination and reasoning power there is more uncertainty of classification, for they possibly may have a part in the foundation of personality aside from memory or physical make-up; but with most people these forces are dependent, as are most other mental traits, on facts of memory, so that we feel safe in our classification. Philosophers declare it is impossible to imagine anything new, only new combinations of old things; and, if this be true, imagination must have memory as a basis to draw on for its combinations. Reasoning in itself may be considered an imaginative memory, simply combining new relations of old facts lying in the memory to form new conclusions. We believe that the

inability of most people to reason lies in mental laziness or a dearth of remembered facts rather than in any lack of power. If this be true, all that is apparently necessary to convince an opponent of the virtue of your side of an argument is to cite your facts, and, if he is a normal person, he must reach the same conclusion as you; but the difficulty lies in convincing your opponent that you are quoting *facts*. It comes back to a question of memory—the facts lying in your mind are not the same as those lying in his, and the real difficulty in convincing an opponent is in making him realize the facts as you visualize them in your own thoughts.

It would simplify all discussions of mental philosophy if we threw mystery into the trash-heap and looked at the mind simply from the materialistic point of view as a soft, folded, animal substance for recording memories as the phonograph records sound. All the many mental qualities then become simply phases, forces, and combinations of memory phenomena. The child's mind is vacant—a blank personality. The senses gradually impress it with various phenomena which become facts of memory. The stomach cries hunger, and pure physical reaction causes it to yell and it is satisfied. Several trials of this brings in the memory of yelling giving satisfaction, so it yells whenever it wants anything. This is the birth of rudimentary reason and imagination, the trial of an old expedient to get something new, based on memory. There is little or no mental process here, but we believe there is not so much mental process in reason and imagination as most people think, what is so called being but a somewhat blundering mixture of old memory records. If the child receives constant gratifica-

tion from its yelling efforts, *selfishness* is developed, and so unselfish mothers develop selfish children. Selfishness in this sense is no mysterious mental quality, but simply the lack of a quality—a collection of memory records telling us that what we want can be attained by being unpleasant. The child does some simple thing and the mother expresses surprise and delight, and admiring relatives all unite in producing memory records impressing the child that it is a wonder, thus developing *egotism.* Egotism thus becomes not a mysterious quality, but a succession of memory records telling us that we personally are marvels as compared with our fellow men. So one by one we can take up mental characteristics and show that they are phenomena of memory. If we use the surgeon's knife and the microscope we can discover little mechanism in the mind outside of the nerves and blood-vessels. There is no set of wheels for reasoning nor another for egotism. It is, we believe, but the recording apparatus for the sense and physical perceptions and feelings; and for its own workings.

For the purpose of dealing with the employee, it simplifies things if we believe this; and in practical application so far, it seems to work. However, there are some people of a logical turn of mind who must be unsatisfied with this limited discussion; and, as we wish to have this particular idea of personality emphasized as strongly as possible, it is desirable to take up a few more points. Such a logician may say: "I will acknowledge the reasoning so far as most *characteristics* are concerned; but what about the power to will, to say to my finger, 'move from this point to that particular point'? What about *pleasure, hate, envy, affection,* and other *emotions?* These are not phenomena of

memory, and yet they are movements of the brain." We answer that there may be some truth in the argument, though we doubt this conception of will; and that our discussion with reference to standardizing labor does not deal with emotions except as they result from combinations of *characteristics,* and characteristics are memory phenomena. This leaves an unsettled state of mind; for if emotions are mental acts outside of memory, then the whole argument is open to doubt, so we will enlarge a little further.

It seems, apparently, that willing to move our hand from point to point is a distinct phenomenon unrelated to memory; but is it? The baby unconsciously finds himself in apparent command of a complicated body machine, but really he has no command, no will power, over it at all for weeks after he is born, until memory has given him guiding points. The obvious answer to this is that he cries when he is hungry the first week he is born; but to us this seems to be only physical reaction at first, as thunder is the cry of an unstable atmosphere. As memory shows the satisfactory results of his crying, he *wills* to cry deliberately as a pure mental process to get his wants. The baby's hands move aimlessly from point to point, and it is months before his memory has recorded that certain muscular movements will move his hand from one point to another particular point. The body through its nerve centres is capable of all sorts of motions through sheer physical reactions, just as a machine can move without hand or mental power once it is started. A chicken with its head cut off moves nearly every muscle in its body. By watching its own involuntary reactions, the child's memory gradually accumulates data to give it *will*-control of its motions, and comparatively

full power is not usually gained until it reaches about five years of age. Perfect control is a problem in infinity. Arguments may be enlarged from this basis *ad infinitum.*

As to *pleasure*—to the materialist it is a set of pure physical reactions, not originating in the mind but being recorded thereon. The pleasure of harmonic sounds has already been analyzed as such by physicists. Vision, being a vibratory sense like sound, gives pleasure probably through its harmonies and gradual transitions, but to tell why would necessitate a book. Pleasant odors and tastes are supposed to come through chemical reactions on our nose and mouth linings, which hypothesis classes these pleasures as physical rather than mental phenomena; but, in our belief, although this is so, it should be added that chemical reactions on the lining must manifest themselves in a vibratory manner, as in seeing and hearing, and pleasure is derived through harmonies and gradual transitions, as in sight and sound. Advancing into the so-called abstract, it will be asked "What about the pleasure in seeing a *homely* friend?" We answer, "You see a 'bunch of pleasant memories.'" We can imagine the psychologist of the future being consulted by a wealthy patient who will say: "I am very unhappy. Give me joy." The psychologist tests the afflicted mind for the unhappy memories and for the media of pleasure. Then he writes out a prescription composed of a scientific analysis of the sense operations necessary to produce the effect of joy on this man's mind, and gives it into the hands of his executive with unlimited funds to get the effect.

We will not discuss hate, envy, and affection, for we believe they can be reduced to physical reactions just

as can pleasure; and, as to affection, if certain body organs were removed, we doubt if there would be much left.

We should like to enjoy the picture of our logician friend backed against the wall, but in one despairing cry, saying: "What of the abstract? Where can you place memory as being able to conceive the abstract?" We can't. When we studied philosophy we were asked to conceive of sphericity or roundness apart from a definite round object. We couldn't. We were asked to conceive of virtue as a beautiful conception apart from its material relation to people. We failed. We were asked to conceive of God without body, shape, form, or material composition. While the mentally exalted rose to this height, we still floundered in materialism. If I am to have a God, he must have concrete shape. While we have been looked down upon with pity by the idealist, we have reached the conclusion that perhaps his mind is not of such marvellous texture after all. Maybe he has been hypnotizing himself. With fear and trembling we announce our doubt of the existence of the abstract. In entering this subject of standardizing labor you will find nothing abstract. It revolves around the two great solid facts of personality—memory phenomena, upon which we can get definite data; and body phenomena, of which we take accurate measurements. In other words, we believe it possible to apply the scalpel to personality and strip it of mystery.

However theories may differ as to the root of personality, it has long been an accepted fact in business practice that memory is the basis of business value, since the one essential that nearly all business men want in a new employee is past experience or knowl-

edge in the same class of work, *experience* being but another name for a phase of memory.

If we could find all the records of a person's memory we would have the sum of his personality. This is impossible and impracticable, as the vast amount stored in the ordinary human mind is trash and it is essential for us to find only the facts which bear on business value. For this purpose we note, as preliminary, facts of age, sex, and environment; and we divide the remaining facts bearing on memory into two general heads: *experience,* or *life-contact knowledge,* the facts gained by actual contact with life; and *hearsay,* or records acquired from books, newspapers, word of mouth, and general say-so. Experience factors are such as will also be brought out by age; sex; parentage; nationality; child history; fellowship, as exemplified in social status, the societies to which a person belongs, and his knowledge of human nature; interests, as exemplified in recreations; present family relations; and more directly by general information acquired by observation; past business experience; languages, acquired by actual contact with life; and terminology, or a person's knowledge of words—all as shown in the diagram on page 68.

Hearsay or authority records are divided into facts of education, reading, mathematics, religion, popular opinion, and accepted theories. While education in elementary grades may be such as to have its good name unjustly blackened by classification as "hearsay," it is still justly so classed, since it does not consist of facts gained by actual contact with life, although the Wirt and Montessori systems are largely rectifying this fault. The higher education goes, the more it enters the realm of hearsay instead of proved facts;

and although this is perfectly right as education, for our purposes we desire a clean distinction between experience and hearsay. Reading is classed in the latter head since many of the records of memory are of doubtful value, attained by reading newspapers, magazines, novels, and even alleged scientific articles. Popular opinion stores a number of misleading ideas in the mind. Facts, based on the authority of a teacher, parent, social leader, priest or preacher, are considered final by the child or mature person just in proportion to the independence of each individual's own mind. Actual observed experience is usually trustworthy. Hearsay evidence, even from a book on mathematics, is of little value until verified by the learner, when it goes into the experience classification. The dependence of a man on experience or hearsay records of memory usually makes the distinction between a practical or an impracticable individual, always bearing in mind that hearsay records are trustworthy if verified by personal observation.

The second great influencing factor in personality consists in qualities grouped under the general head of physical make-up. Where a person is destined for physical labor this is the most important consideration from the business standpoint. Where a person's work is largely mental it is still a prime factor, for our intelligent life is largely influenced by the sub-classifications in this heading—health, vitality, sense reactions —measures, shape, color, action, strength, speed, control, arms, hands, fingers, and general action. Voice and appearance are placed midway between mental and physical qualities, since they partake of both elements.

The old questions of heredity and environment bob up in this discussion. They are both strong influencing

factors, environment having a controlling influence on our collection of memories, and heredity a controlling influence on our physical make-up. These two interact; environment, working through the mind, will develop the body; and heredity, working through the body, will exercise a strong involuntary influence on the mind. As an illustration, a child inheriting a weak and diseased body will fail in any physical work he attempts. If his environment allows, he stays at school when the strong drop out for remunerative jobs. If environment does not allow this higher education, he probably will fail in jobs requiring either physical or educational qualifications. He then becomes a thief or a tramp, and his end is the product both of heredity and environment. He is an involuntary victim of circumstances, although he does not know it, and society does not recognize it.

Here again matters will be simplified if we believe mental qualities to be memory phenomena, for then it must be granted that we do not inherit clear, distinct memories. We believe, however, that possibly lower animals do inherit distinct memories, thus accounting for the so-called instinct of a bird in building its nest. The nearest approach to this in man is a vague inherited memory of fear, which possibly lies more in the nerve centres than in the mind.

Reasoning, imagination, egotism, ambition, and will, have a classification very distinct from other characteristics. The others already discussed are latent potential characteristics; but these five are the great driving powers of personality.

The final classification is one of personal qualities. They cannot be considered as vital sources of memory, nor as driving powers of personality, but they are the

united product of these, consisting of accuracy, mental speed, skill, concentration, estimating, handwriting, handshake, musical ability, artistic sense, economy, reliability, executive ability, system, conversation. United, they will show the quality of product of any individual; and with allowances for capacity and driving power, they form his actual money's worth.

Nearly all the characteristics here considered are subdivided into a number of minor traits which can be seen on our card arranged for filing-index purposes. *

Ratings can be made on nearly every characteristic which we have discussed—in many cases with approximate accuracy, in others only by personal estimate; but numerous factors of safety are allowed for, so that the final actual calculated record of an individual is very close to the facts. If we can get only the ratings on capacity and fail on the rest, we have succeeded, for the others can be approximately computed therefrom; or if we can only estimate the driving forces * (or qualities), by working back mathematically we can get an approximate record of the rest. Many characteristics are elusive, and not capable of direct computation; but they are composed of several other essentials which can be found and their resultant will give the elusive characteristic.

We do not assert that the intricate mathematics of personality is solved as yet, but there are so many factors of safety and means of arriving at decisions that the result of what we have is trustworthy.

Finally, what we have to say is hearsay evidence to the reader and will be of little actual value to him until he makes personal test in these matters and embodies them among his experience assets.

* See insert, page 52. The arrangement differs from the analysis shown, being adapted to strict business use.

Chapter V

THE THREE LAWS OF LABOR STANDARDIZATION

The Law of Averages.
The Law of Extremes.
The Law of Human Action.

THE preceding chapter has been valuable mainly in so far as it has disclosed the philosophic basis upon which we propose to set standards for man. It is not scientific, because its theories are yet matters of investigation—which statistics may modify, but we hope will not disprove.

Some reader may ask, what has the new science of standardizing man which is absolutely dependable, and can justify its assumption of the name of science? It is the purpose here to assert and explain three laws which are basic to the science, and, we believe, will remain permanently at its foundation. They will take the matter out of the realm of speculation, and present the subject as one which any business organization can use with profit, if it abides by certain laws and has a man of sufficient calibre to see that they are put into operation.

The first great law is one that has been used in nearly all sciences; we may call it the *Law of Averages.* As applied to our science, we may express it thus.

Any characteristic of any large number of persons will always average the same as the same characteristic of any other large number of persons of the same type, and under the same conditions.

Let us take as an example the height of mature man. If we stood on the street in New York City and compelled the first thousand men that came along to step into a room and be measured, we should find their *average* height to be a trifle over 5 feet 7.5 inches. If the circumstances continued to be similar and we continued our experiment until we had measured up another batch of one thousand men, we should find their *average* height to be also a trifle over 5 feet 7.5 inches. Now this is not a coincidence, but a law—an example of the law we have just expressed, and it is tremendously significant.

If, however, when we were about to start on the second thousand a negro parade had come along and we had taken our thousand men from this parade, we should probably have found a different average. If, again, we had moved to Japan and corralled the first thousand men that passed in a Japanese city, the average would be less. These facts are just as significant as the former and illustrate why the law must be qualified by the words "*same type.*" Were it not for this variance displayed in the latter cases the law would be useless.

It is *individual variance from average* which furnishes us a means of classifying men, and finding how much and why they differ from others. If we find that the average lifting capacity of a thousand ordinary men is 200 pounds, and then we find that a hundred men we examine have an average capacity of 300 pounds, we judge that there must be something significant about

these last men and are not surprised when we find them to be laborers.

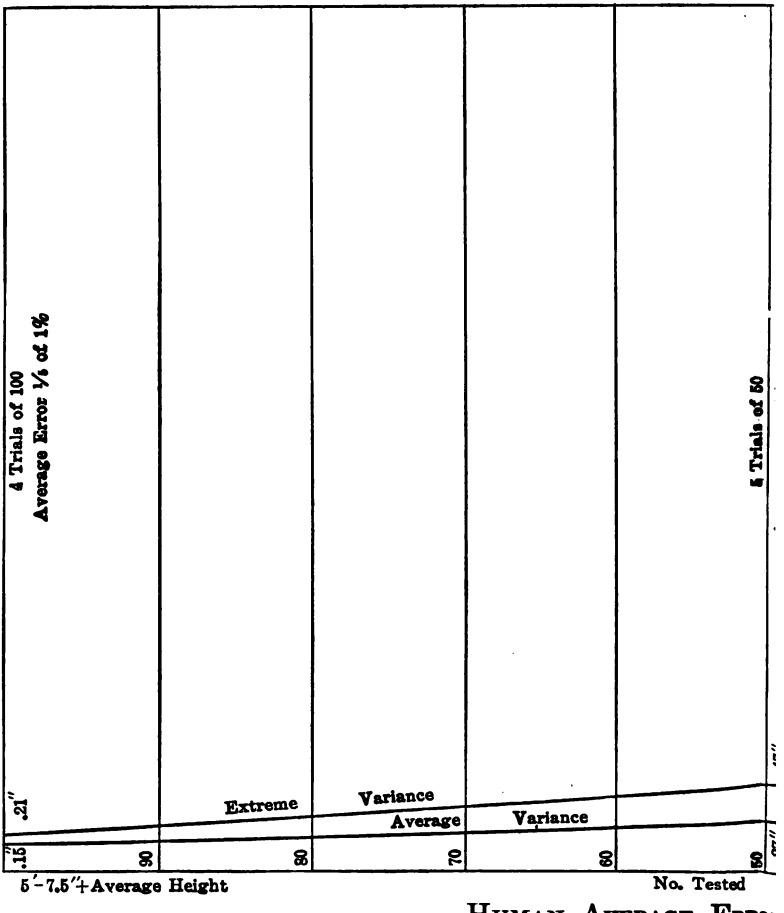
We tested thirty-five railroad clerks and found their average ability in adding was 8 columns in 30 seconds. We tested ten clerks in a manufacturing company and their average under the same test conditions was 13. We have thus reason to suppose that there is something significant in the difference of the records, for (as we shall see later) a variance of over 50 per cent is not likely to occur by chance.

The average is the great dependable basis in standardizing men. In our tests no impossible ideal is made for the attainment of men in certain occupations; all that is required is that they shall simply meet the average of other men in their line. No arbitrary standard is made, such as the figure 70 in school examinations, since the average human qualities essential to "make good on a job" must be revealed by the workers themselves in a series of tests. This average is self-determining and is all that is necessary, or at least just, as an ideal.

One of the difficulties in the application of this law consists in the smallness of the number of people usually working on a certain type of job in any organization. The fewer there are to test, the more liable are personal idiosyncrasies to annul the usefulness of the attempt to apply this law. Thus if five men work at packing cases, and one happens to be a man whose outside interests consist in the pursuit of electrical knowledge, his erudition therein would produce an abnormal weight in the electrical knowledge applied to the packing of cases, if the average were compiled on only these five men. As such knowledge would have nothing to do with his job, it would produce what we call

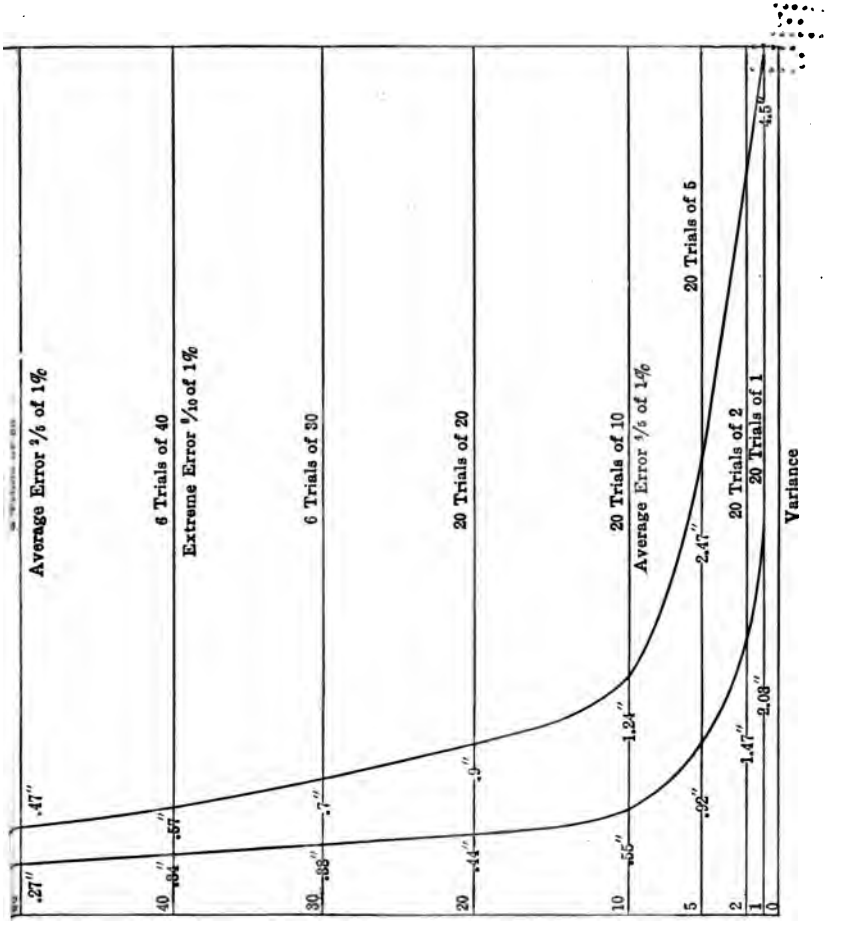
an "erroneous job average" if only a few men were averaged.

For this reason we have prepared three graphical presentations to show the nearest approach to safety in compiling averages from a few people. The first of these charts, "Human Average Error Chart for Heights" facing this page, shows the chance of error in computing averages for less than one thousand individuals. This chart shows as far as averages of only one hundred men at a time. If extended to ten times its length, the lines indicated "extreme variance" and "average variance" would converge into the line showing "average height." The distance of the curved lines from the "average height" line will thus show the variance from true average. It will be seen that where the chart ends in averages of one hundred, the average chance of error is only 0.15 of an inch from the average height of 5 feet 7.54 inches, and should we happen to include an especially large number of men of odd heights, the extreme chance of error in computing a true average would be 0.21 inch. This chance of error increases as the number of people computed decreases, until at five persons we have an average chance of error of 0.92 inch, and may run into an extreme error of 2.47 inches. Variance in extreme error, however, depends on the number of trials; thus coming down to one man taken alone, we took twenty cases and did not find a man over 6 feet high; hence we made no extreme error greater than 4½ inches. On a percentage basis this chart shows that if an average of one hundred people be taken no greater error than ½ of 1 per cent is probable, and that in an average on only ten people the chance of error will run from 0.8 per cent to about 2.0 per cent.



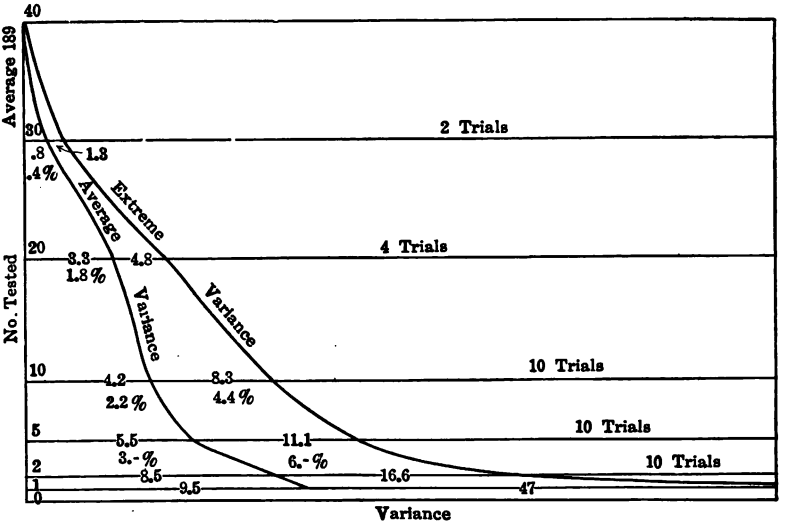
HUMAN AVERAGE ERRO

The line above this reading represents the average height
head of a man of average height, 5 feet, 7.54 inches high, the
variances from true average found in averages on trials of nu
ent averages of one hundred men on the left and ending with
curved line represents the average departure from the true av
is the number averaged with the exception of the numbers at
departure in inches, full scale, from the true average. The th



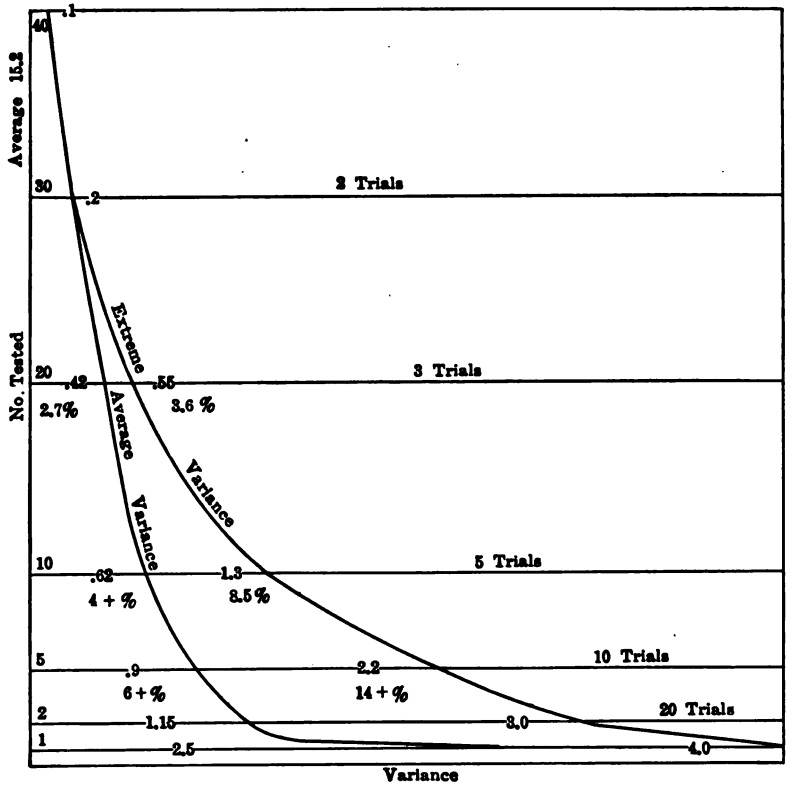
DR CHART FOR HEIGHTS

t of one thousand men. If this line rests horizontally on the he top curved line shows in full scale the extreme errors or numbers less than one thousand, beginning with four differ- th twenty trials of one man at a time on the right. The lower verage height in small averages. The bottom row of figures at the extreme left. The second row of figures is the average third row is the extreme departure.



HUMAN AVERAGE ERROR CHART FOR LUNG CAPACITY

When averages are compiled on characteristics controlled by human development and will power, the variances from a true average are much greater when small numbers are taken. If five people are averaged for lung capacity on a job requiring endurance, one may have especially trained himself to breathe deeply and his exceptional record might have little to do with the job. This would produce what we call an error in computing the job average, since one exceptional record could materially raise the average when reckoned with only four others, while it would produce little effect if reckoned with one hundred others. It will be seen by this chart how such errors increase as the numbers averaged decrease. The horizontal lines show the numbers tested, the number in each test being shown in figures to the extreme left. The curved lines show the variance from the true average, each point being separately figured. The true average is considered coincident with the line to the extreme left along which the numbers tested are written. Taking the line where ten are averaged, as shown at extreme left, the 4.2 means 4.2 cubic inches departure from true average by taking the average error of ten trials, and it shows one extreme error of 8.3 cubic inches. This, however, means only an average error of 2.2 per cent and one extreme error of 4.4 per cent.



HUMAN AVERAGE ERROR CHART FOR ARM SPEED

In computing a natural arm-speed record for a job, one girl (who had been a telephone operator) made a phenomenal record. When only five were taken at a time her record raised the average of what could be expected on the job, producing what we call an erroneous average. Such tests allowing extreme individual variances are likely to be misleading. This chart shows that there is a possibility when five people are averaged of getting an extreme error of 14 per cent. The true average, which is assumed to be correct on forty-five people, is 15.2 movements. Taking the line where ten people are averaged, as indicated by figure 10 at extreme left, it shows there was an average error of 0.62 of a movement, or 4 per cent; and that there was one extreme error of 1.3 movements, or 8.5 per cent in the five trials. While it is ideal to get large numbers in forming an average, an error of less than 10 per cent furnishes a dependable working basis.

This chance of error is so small that averages computed on ten individuals may be regarded as comparatively safe *when the range of variance is confined within small physical limits,* such as possible variance in physical measurements.

When, however, possible variance may range from the ground upward to the sky limit, small averages are not so safe, but may still form a workable basis. The next diagram shows a greater degree of variance (page 83). It shows chance of error in a case where not only physical limit is at issue, but development and will power. It is a chart entitled, "Human Average Error Chart for Lung Capacity," showing the chance of error in computing averages of lung capacity for women. The greatest number averaged was forty. Four trials of twenty each were made, showing an average error of only 1.8 per cent. When, however, ten trials were made of ten subjects each, the average error equalled 2.2 per cent and there was one extreme error of 4.4 per cent. When ten trials were made in each of which five women were averaged, the average error was a little less than 3 per cent. In this case averages on small numbers were near enough to give fair results.

The third case (page 84) is shown in the diagram entitled, "Human Average Error Chart for Arm Speed." This consists in averaging forty-five subjects who were tested for arm speed on the match-board. The class was mixed, of men and women. It will be seen that errors when ten subjects are taken at a time averaged 4 per cent, with one extreme mistake of 8.5 per cent. When taken five at a time the average error is over 6 per cent, and there was one extreme error of 14 per cent.* We may conclude from these examples

* By computation from the first chart there is a possibility of these last two charts starting at 3 per cent error, in which case it may be safer not to depend fully on averages of less than fifteen when there is wide range of variance.

that observations based on averages computed on fewer than ten persons are not quite dependable where we are testing characteristics with possibilities of wide variance. We may further conclude that averages computed on as few as five persons may form a workable basis, if the possibility of variance is not great. As our work is usually based on classes ranging from ten to forty persons, the findings are dependable within the limits we have shown. There will be some inaccuracies, which time will correct when we have computed averages running into the hundreds and thousands, or when several investigators combine their findings into one average. Fallibility is a factor with which all investigations have to reckon, and we have yet to find the infallible man. We have tried to show in these charts the main elements of error in this work, and as they will usually run less than 5 per cent, they will interfere but slightly with the working basis. Errors, as we have tried to explain, will be due very little to mathematics, but more largely to some exceptional characteristic which a person may have and which will unduly weight results when small numbers are averaged.

The second great law of labor standardization is the *Law of Extremes.* This may be expressed as follows:

The extremely efficient in any line of work, when compared with the extremely inefficient, will make a higher average in the characteristics essential to the work; and both extremes will average the same in characteristics which are not essential to the work.

By the *law of averages* we test the man. By the *law of extremes* we test the job. Expressed in more homely words—the best workers on a job will rate much higher on *essential characteristics for the job* than the poor

workers, and they will come to the same average as the poor workers in non-essentials. For instance, in testing high executives in the tests already shown they made much higher ratings than sub-executives in the *personal opinion test, general information test, comprehension test,* and in *patient analytical detail,* while they made approximately the same average as sub-executives in *thought speed, memory of names and faces,* and the *advertising test.* We concluded from this that the first four qualities are very important for the job of executive, while the last three are non-essentials. This law is the great safety regulator of labor standardization, and we have had many of our most beautiful theories fall before it. In other words, we do not rely on theory as to what tests are essential for a job, but actually try out a number of tests and reject those which are not successful. It may be a most plausible theory that thought speed is essential for an executive. We picture an executive as a man sitting at a desk and giving quick decisions, one after another, on the day's work; but when we come actually to try it out, we find it is not necessarily so, and the executive of slow deliberation may be just as successful as the more speedy man. As there are many types of executive, this may not be conclusive in regard to work requiring quick decision.

The tests we shall discuss later will be an attempt to prove the law of extremes, so that we do no more than outline the law here. It is really the most difficult end of the problem, for we can already analyze the man with fair conclusiveness by the *law of averages,* and distinctly classify his characteristics; but the analysis of the job is more difficult, from the fact that many companies have no dependable methods by which we

can already tell who are their best and worst employees, in which case we have to do some preliminary work to find this out. Again, the workers on a single job may be so few that we cannot find five very good workers to compare with five poor workers, and five is the least number upon which can be compiled safe averages for comparison. When we are confronted with this situation we still have to rely largely on theory, and this becomes dependable if the experience and analytical power of the examiner are such that he can give the essential tests from records already compiled on similar work.

The third law upon which this work depends is the *Law of Human Action* which may be expressed as follows:

All individuals with the same characteristics act alike under the same conditions.

This law finds its application only relatively, since no two individuals have the same characteristics; but we can assume that the nearer the characteristics and conditions approach, the more likely we are to get the same action. For instance, nearly all employees are alike in the characteristic desire for money. Supply any man, therefore, with the conditions of $5 a day and a safe job, and he is approximately sure of action in accepting it as against the conditions of a $2 a day and an unsafe job. If a man should turn it down there is something the matter either with his characteristics or the conditions. There is little doubt of uniform obedience to this law in one hundred cases out of one hundred.

We found a group of men who were very much alike in good mathematical speed and in comprehension, but with one exception they showed no phenomenal devel-

opment in other lines. Presented with ordinary office conditions, is it remarkable that their action has been approximately the same in the last five years as fairly good plodding clerks? One of these men we found to have large commercial instinct, as revealed by a wide knowledge of costs and materials even outside of his work. He had also fair analytical ability, but not such as the high executives we have examined. Knowing his characteristics to be the same as the semi-executives we have examined, we take little chance in assuming that his action would be just as dependable when confronted with the conditions of semi-executive work.

By the *Law of Averages* we find the comparative rating of every man on a job. By the *Law of Extremes* we pick out the essential characteristics for the job. By the *Law of Human Action* we feel comparatively sure that when we have a man who can meet the essential characteristics, he will make good on the job. By the *Law of Averages* we can doubly check the work by finding if the workers as a whole make a higher record than ordinary human average in the essential characteristics found by the *Law of Extremes.* This last is especially useful if the extremes are so few as not to form a safe average by themselves.

Chapter VI

STRENGTH OF MEMORY

Qualities specially important in salesmen, hotel clerks, waiters, and elsewhere of general application. Tests for tabular variety, reasoning type, eye and ear memory, touch memory, memory of design, memory of names and faces.

WE have already discussed memory as one of the bases upon which the system of standardization rests. The present treatment is concerned with the strength of various phases of memory.

Memory is of various kinds. Some types of mind can remember a succession of words or figures with great ease and may be described as the tabulation type. Others are very poor on such tests, but can remember the reasons for things, or can even remember tabulations if some reasoning element or chronological order enters therein. Such are of the reasoning type. It is claimed that there are types of mind that remember things heard better than things seen. Our experiments so far show no decided results in this. There is the memory of touch, by which some people can tell the quality of goods better than others, and there is memory for design, form, and locality. Whether these last three are all distinct characteristics has not been fully determined as yet.

Memory without doubt is of vast importance in the business world. The best silk salesman in the Gimbel stores has made his great records because he can remember the name of any customer who buys a good bill of goods. It pulls those customers back over and over again. They want to go to a man who can call them by name. The head of a great drug-supply house says that the man who can carry the names and locations of their thousands of chemicals is of incalculable value to them.

This element appears even in vocations where the use is not so distinct as in the above instances. We had the privilege of examining Miss Rose Fritz, of the Underwood Company, who held the world's typing speed record for four years, and also Miss Friedman, who recently took the world's amateur record. They both had phenomenal memories.

Memory can be very accurately determined. A good test for the *tabular* variety, which we have used, is the submission of a printed composition of one hundred words. The copy is submitted to the persons under test, with the reading turned down on the table. Explanation is very clearly made as to the nature of the test; the subjects are then told they will have five minutes in which to memorize the copy, and that it is not expected they can get it all—only as much as possible. At a signal the paper is turned, reading side up, and the subject commences to memorize. After five minutes the subject is directed to turn the paper blank side up and the papers are collected during the next three minutes. They are then given ten minutes to reproduce the copy.

There being just one hundred words, the markings can be made on a basis of one mark for each word.

A marking on "tabulation" memory will consist in the actual number of words remembered so long as they make sense, even though misplaced. A separate marking under the "reason" head should be made. This marking will be 100 if the entire sense of the composition is reproduced regardless of wording. The composition should have ten reasoning elements interwoven so as to make an intelligent basis for the latter record.

It will be noted in the above test that the subjects have the assistance of eyesight to fix the wording on their minds. To test the *ear-memory,* a paragraph of thirty-three words should be read slowly, twice. After an intermission of two minutes, the subjects should be given three minutes more in which to reproduce the phrase on paper. The number seems rather arbitrary, but it gives a rating easy of calculation, three for each word making approximately one hundred, if perfect. A smaller number is too easy, and a larger number of words too confusing.

Many questions will come up as to how to mark these records, which are not touched here, as it would needlessly extend this chapter to discuss them.

The Curtis Publishing Company has an *eye-memory test* consisting of the ability of the subject to remember twenty objects shown on a card, and the National Cloak and Suit Company has an eye-memory test similar to the above 100-word composition test. The only trouble with this latter test is that it is a great time consumer, both in giving and in marking, and economy of time is a great factor in business life.

To obviate this trouble I have made a test to cover this point on the match-board described in the introduction, but its application so far has been for ear-memory only. A set of the holes on the match-board is

numbered consecutively, reading (from left to right) from 1 to 230.

The subjects are directed to listen while ten numbers are called off quickly, then to put sticks in the designated holes, but not to commence until a signal is given. This test is given twice. The number of figures they remember will show their tabular ear-memory. No reasoning element enters into this. It is a sheer feat of memory, and quite difficult when numbers of two integers are given. The time element need not be considered.

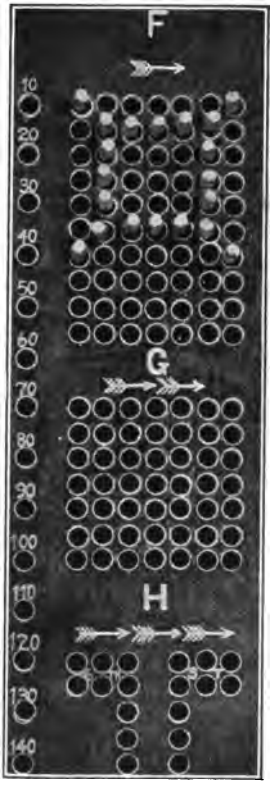
One can change this test so as to make it one of eye-memory by exposing ten numbers at a time on a chart, giving a certain number of seconds to memorize and reproduce. No tests have been made in this to my knowledge. Eye- and ear-memory both will receive ratings from all the above tests.

Touch-memory is largely a new field of investigation, in which we know little at present. Psychological apparatus consisting of two needles adjusted at various distances apart has been used on various parts of the body to find relative sensitivity, but the business world is concerned principally with delicacy of finger touch, useful in determining the quality of materials and goods. We are dealing with *memory* of touch here, as distinct from *delicacy* of touch, and, so far as I know, no scientific analysis has been made of this subject, from any standpoint useful to business. We would suggest tests of touch-memory on wires of certain mesh, or on cloth of a certain number of strands to the centimeter, or simply on various kinds of fabrics. Madame Montessori has done some work along this line with small children but, to my knowledge, the results have not been tabulated for use.

Memory of design or form has been very thoroughly tested. Apparatus for this is used in our immigration department, and Mr. P. J. Reilly has used it for testing employees for the Dennison Manufacturing Company. The apparatus consists usually of the Seguin Form Board—a board with different-shaped holes therein, and blocks correspondingly shaped to fit. Picture puzzles, cut into various shapes, form a good test, and have been largely used by psychologists. It is not asserted that the foregoing are distinct tests of memory of form, since they lie more in the lines of conception of form; but memory, we believe, is a large element therein. The Dennison Manufacturing Company have abandoned the form-board test as too easy. A test which we have used is made on the match-board, mentioned in the introduction, where the subject makes a design out of sticks. A chart with twenty spots arranged like a tile pattern is shown for fifteen seconds; and then, after careful explanation has been made, is removed. The subject is expected to reproduce the pattern with sticks on the match-board as nearly as possible. It makes a very quick test. The method is illustrated on the opposite page.

These form tests are considered very important in finding the mental range of a person, and (except the last) have been used to determine whether subjects are below average intelligence. The immigration department rejects all subjects who cannot reach a certain standard. So far, we have not found these tests for memory or conception of form of any significance in the particular occupations we have examined. However, in textile and artistic industries, and for some salesmen and stock clerks, they will evidently be of great importance.

On pages 29 and 30, in Chapter II, will be found an accurate test for *memory of names and faces.* The subjects are asked to look at the faces on page 29 and to associate the names attached to the corresponding pictures. They are told that on the other side of the sheet will be found the same faces, but arranged in different order and without the names attached. They are further told they will be asked to write the names of these people from memory; that the most important thing is to remember the last names, and the initials and first names only if they can. They are then given two minutes in which to memorize. Then they are instructed to turn the sheet, and on the margin of the paper to put down the names according to the numbers indicated. One point is allowed for each name remembered, and one-tenth of a



MEMORY OF FORM AND DESIGN

This shows a section of a match-board. The design shown in section F is displayed on a wall chart for 15 seconds; then it is covered, and 45 seconds are allowed for its reproduction with sticks in the holes shown above. This is ample time if the subject remembers the design. Only about one in ten of factory workers can remember the complete pattern. In section G the same test is repeated with an irregular arrangement and very few can remember the pattern. The test showed no significance in jobs examined by us, but should prove of value where memory of form has anything to do with aptitude for the work.

point subtracted therefrom for every initial or first name forgotten. On this basis the average on this test for seventy-one high-class people we found to be 5.4. This makes a very good test for salesmen, since it tickles the vanity of customers to be called by name. We have all had the experience of being unexpectedly called by name in some store, or having our favorite brand of cigar handed to us without our asking, and such experiences send us back to the salesman who knows us. One of our large wholesale firms in New York has a man at the door whose business it is not to sell goods but to welcome customers. It is his duty to remember their names and where they are from. Buyers will naturally gravitate to this establishment because there is someone there who knows them. We have heard of a hotel manager who has a set of duplicate cards printed of the name of every guest. He requires that his clerks, head waiter, and every employee who comes in contact with guests shall memorize these and call his customers by name.

Chapter VII

AGE AND SEX

Application to light and heavy work, typists, and general. Comparative sex tests for speed in action, intelligence, eye and ear response, memory, reasoning, detail, honesty, tact, general information, decision.

ALL employment men are united on the necessity of considering the age of the candidate for every job. Railroads and insurance companies usually want young men from eighteen to twenty-one, with unformed habits, so that they may be permanently molded to their future occupations. As the positions they offer are much sought after, they usually get the pick of the market in youth. Most other enterprises desire the same class of human material but have to take what they can get.

This seems to be an age of youth, and one is constantly surprised to find that the managers of many of our large companies are men little past boyhood. In many cases this is a matter of necessity, for the older men of today had their training in the age before this electric and scientific epoch. Related to our system, we should find that this is because the memory facts of the present generation have in many cases proved of greater value to business than those of the

older generation, so we must regard this demand for youth as the survival of the fittest in fact-equipment. Those of the older generation who still retain a guiding hand on business are the ones who can still learn, who have never gotten old enough to graduate from the school of life. Notwithstanding this natural demand for young blood we sometimes wonder, however, if it is not overdone.

The age peaks of efficiency in business undoubtedly vary much in different occupations. We have not endeavored to compute them as yet, since data are necessarily limited in this early stage of standardization; but the subject is of such importance that the future may see learned volumes written thereon, and the matter will be calculated with scientific nicety. However, in standardization no career is blasted by a single test, and no man can be condemned without a further hearing simply on the score of age. In fact, we believe that the elder men will find even a wider range of work in the future than they have at the present day. Ratings are given on capacity and not age. If age is unfitted for the job, it will come out in the tests without any arbitrary dead line. It is interesting to know that the Ford Motor Company do not have the arbitrary ruling against age that some firms have. They employ old men if they are fit for the work.

Contrary to the opinion of many, it has been shown by most psychological tests that young men under twenty years of age are quicker in action than young women. A superintendent in one of the factories under my investigation confirms this in his own experience. In very swift feeding operations he finds that only boys can stand up to the speed necessary. However, so far as our own investigations show to date, there is

very little appreciable difference in light speed operations between men and women when they are over twenty-five years old, unless sense perception enters into the operation. We have found that men can respond more quickly than women to eye and ear signals. This is probably through baseball training and other quick-action games.

In discussing such a close point as sex superiority, conditions controlling the giving of tests have to be considered very carefully. Theoretically, women should excel in very light speed operations, since they are smaller than men and this gives them an advantage, according to the laws of inertia, which we will discuss under finger movement. When the operation grows heavier a strength factor enters in, which naturally places woman at a disadvantage, so that the question whether women or men can excel at certain medium-class work can be solved only by practical tests. The point at which the task grows too heavy cannot be solved by theory. Again, as to intelligence in work, it is probably a fact that up to twenty years of age girls are brighter than boys of the same age since it takes the latter longer to mature. As many applicants we have examined by mental tests were under age, the statistics are somewhat influenced by these conditions. In the Personal Opinion Test, shown in Chapter II, the majority were older people and the men made a record of 61.81 per cent in intelligence as against 44.5 per cent for women; but this is not a just comparison, since the male list was weighted by high-class executives, and twelve of these men had the determining vote as to whether the answers were right or wrong. Statistics gathered from tests are not reliable unless the working circumstances are exactly the same, or a

calculated factor enters to reduce them to uniformity. Except where sense response was a large factor, women under our tests have made a slightly better record than men in light hand-operations; but conditions were not the same, since speed had not been a factor in the pay of most of the men where it had in that of the women; and, consequently, the latter had been pressed to high-speed action and were especially developed in this line.

To find the mental difference between the sexes we compared twenty-eight employment blanks, filled out by men, against thirty-five filled by women. The applications were for type-writing positions. It was found that the average age of the men was seventeen and one-half years while the women averaged twenty and a half. This must be taken into account in the findings, and allowance made for faults due to lack of maturity among the boys, while the things in which they excelled must count strongly because of their age handicap. In memory the men and women averaged the same, making 6.9 points. In reasoning, the majority made zero, but the women excelled slightly, making 2.2 points against 2.0 for men. In attention to detail the problem was such that total failure resulted if one point was neglected out of a number submitted. Only two out of fifty had minds that could pay attention to all the details of the problem, but allowances were made for several who were almost perfect. The average was 1.2 for the men and 1.0 for the women, showing that the men had 20 per cent the advantage in attending to detail.

As to honesty, the test consisted in the answers to the questions on the blank relating to drinking, smoking, swearing, gambling, lying, etc. Assuming that no

one is perfect, we marked adversely anyone claiming perfection in this entire list; and from facial analysis and the general trend of the answers we judged that we did them no wrong in this regard, for only one or two could be classed as Puritan in genealogy. Ten out of the twenty-eight men claimed perfection, while only seven of the thirty-five women stood firm for this point. However, the men who confessed did it thoroughly and thereby made the greatest number of points. This is the more astonishing, as most people have supposed that women usually claimed for themselves almost a monopoly of the world's virtues. Since our fallible personal opinion entered largely into the number of points credited, we thought the most just method was simply to mark not higher than one point, this being given for one or more confessions. On this basis, the women made a record of .80 for honesty against .64 for men. On a 100 per cent basis the women would make 80 per cent and the men 64 per cent.*

In the ability to word a tactful and intelligent letter the men made 3.9 points against 3.7 for women, on a basis of 10.

In general information picked up by observation of things not learned in schools, the men made 5.3 against 4.2 for women. As this is largely a man's world, it is only just to say that the women were under a handicap in this test. The record was made in answering a list similar to the questions on general information given on page 38.

As to decision, the men made 9.4 points against 7.8 for women. This test was made solely on the number of questions answered, those who left our questions

* A large employer of labor expressed to me his very positive conclusion that women were more honest than men.

blank being rated as low in decision. They evidently so vacillated in their minds as finally to answer nothing; or they lacked the courage, fearing imaginary consequences; or their minds were blank, not knowing what to answer. Whatever the reason for failing to answer, we reckoned it as lack of decision; and the men showed quite a decided superiority in this. Possibly the detrimental comparison by which the men rated lower in honesty may have been due solely to their more decided character. Many women evaded claiming all the virtues by leaving some of the questions blank, while the men did not hesitate to answer one way or the other. According to our rating, the leaving of these questions blank counted in the women's favor and we may have done injustice to the men thereby.

As to sex rating, it is well for those who are undecided whether to pick men or women for certain jobs to know these findings; but where these qualities are separately rated, we do not give any credit or debit to sex considerations, for our tests will more accurately place each individual regardless of sex.

Chapter VIII

ENVIRONMENT

NATIONALITY; PARENTAGE; PRESENT FAMILY; SOCIETIES; SOCIAL STATUS; HISTORY; INTERESTS; HABITS

Application to laborers, garment workers, automobile shops, bonded employees, cigar salesmen, chauffeurs, pilots, crane hands, aeroplanists, steeple jacks, bridge builders, book salesmen, watch-making.

Tests: Employment-blank, records, societies, history, interests, games and sports, studies, musical instruments, interests and habits.

National characteristics of laborers, and other workers. Henry Ford's idea of the contented worker. Cost of family as an influence. Societies as an indication of fellowship. Life history as revealing the man. The total abstainer a much sought man.

ENVIRONMENT, early and present, exercises a strong compelling influence on every person's work. It stores the mind with the facts and impulses which determine action. All memory impulses contribute, but we have chosen the influences heading this chapter as being more specifically environment factors.

Nationality has a distinct influence on work. In our interviews with various employment specialists we find fairly general agreement that Swedish laborers are ideal; they are strong and intelligent but scarce;

that German workmen are patient and thorough; that a Scotchman will drink but is honest; that Italians are the coming garment-workers. We could quote general agreement on various detrimental estimates, but we fear the consequences. Some firms use nationality in a competitive way, setting gangs of different nations to beat each other's records, with good results. In a few years, definite statistics as to national traits will be ready for use; but we have not much that is trustworthy at present.

Parentage is an obvious factor in the making of the worker, but its records are so bound up in nationality that it is hard to keep the results separate at present. It is not of so much importance in America as in foreign countries, where trades run in the family for many generations and develop distinct traits. It must be mentioned here as a factor to be reckoned with, but it has received no scientific treatment of value to business that we know of.

The *Present Family* environment of an employee is considered of extreme importance. Henry Ford believes that the man in contented family relationships is the best worker, and he makes quite thorough investigations in the matter. Fidelity companies look with suspicion upon men separated from their wives or who have serious family sickness. They do not necessarily refuse to bond them, but they look well into their history before taking a chance. Many firms have calculated the cost of supporting a family as compared to the wages they pay, and will not employ a man if they cannot give enough to support his family. This latter point is of importance in the staying quality of an employee, as experts say that a man who cannot support a family on his wage will accept a job only as a tempor-

ary expedient, and hence the firm may expend useless money on training a man who is sure to leave them when he can. Blanks for obtaining family data will be found in our employment sheet, and space for entry thereon on the filing card.

Societies, clubs, or social organizations of any kind all attract certain classes of people. A bonding company in New York has a moral rating on the various popular national and local organizations, and a man's moral status is judged somewhat thereby. The number of societies a man belongs to will show his social nature and gives a line on his good fellowship qualities. This is theoretically a quality of salesmanship, but we have not tested it by the "law of extremes" as yet. Official positions in a number of societies will give some data as to a man's qualities of leadership, where that is a business essential. Record of a man's membership in various organizations can be secured by the employment sheet, and entry made on the index card under "Societies."

The *Social Status* of an employee is usually obtained by the observational method and by various answers on the employment sheet. It is usually obvious without the necessity of scientific treatment, but its use as a labor factor is not generally understood. Mr. Peterman, of the United Cigar Stores, tries to place his salesmen in congenial stores where they will handle people of the same kind as themselves. This is a delicate refinement of salesmanship which many of the customers of these stores appreciate without knowing why. It is an important factor, which should be considered in all sales organizations and may explain the apparently inexplicable failure of some salesmen in certain fields after a uniform success in others. Social

Status is recorded in our index card under that heading, and is subdivided into wealthy, upper, medium, popular and low classes.

The *History* of an employee's life, if he has the intelligence to write it out, will furnish data on his egotism, determination, education, ambition, interests, habits, and other valuable data. The "History" heading in our index card furnishes records as to whether the subject is *country* or *city bred,* what are his *home* and *self impulses,* his *ventures, financing ability,* the inspiration of his *environment* and his former *success.* Nearly all employment experts keep a sharp outlook for country boys. The youthful or later ventures of a candidate will show whether the subject has initiative, and this will determine to a great extent whether he must be given work that exercises his interest by giving scope for his initiative, or whether he will ever be satisfied with a routine job. Back references will frequently be made to this subject of history as we proceed.

The *Interests* of an employee, outside of his work, often have a direct influence on the job. A fairly complete record of these interests can be taken from our employment sheet. (See the "Employment Blank," Chapter III, pages 53 to 61.)

Under *Games and Sports,* in the employment blank, it is safe to judge that a person who plays checkers, chess, and whist has some thinking ability. Those who like football, baseball, shooting, skating, and bicycling, or many outdoor sports, are fond of the outer life and should do fairly well on outside jobs. Those who are good in bowling, pool, billiards, and shooting should have a fair sense of aim—one of the qualities of chauffeurs, pilots, crane handlers, etc. Those who are good at skating and bicycling have the sense of balance, one

of the qualities requisite for aeroplanists, steeplejacks, or bridge builders.

Under *Studies* and favorite authors in the employment sheet, a taste for various intellectual pursuits will have their obvious applications. A man who likes scientific studies would be better in the technical-book department of a store than a girl who was fond of Laura Jean Libby.

Players of the violin and banjo should be good in jobs where delicate fingering is necessary, such as watch-making. Piano playing should be a help to jobs where quick finger dexterity is necessary.

None of the above suggestions are conclusive without confirmatory data in direct tests.

Every interest in life has its influence on an employee's work; and a studious perusal of the apparently conglomerate list of subjects which the employee is asked to mark in the employment blank will show that they all reveal some trait or taste of mental and physical dexterity. Each element which makes a man enjoy certain outside pastimes may indicate the assignment of work to him that will utilize the same natural impulse.

Habits are an acknowledged influence on work. Record of habits can be secured from the employment blank, by medical examination, and by observation. There is a growing sentiment in favor of employing the total abstainer in dangerous occupations; and given equal ability otherwise, the temperate man is always sought for in any occupation. Smoking is not a vice outside of office hours, nor during work in certain occupations. It is even a help at times in salesmanship, bringing a fellowship that puts a customer in a favorable attitude. Drugs and gambling unfit any man for

the handling of money, and are detrimental according to a man's responsibility on his job.

It will be seen from a glance at these various factors of environment that an intelligent knowledge of the man will enable us to place him to greater advantage. They are not calculable factors like most of our work, but simply matters of record by which we may arrive at surer judgment.

Chapter IX

LIFE-CONTACT KNOWLEDGE

Observed and General Information; Business Experience; Language; Terminology

Application to executives, clerks, stenographers, editors, machinists, weavers, type-setters, and general workers.

Tests: General information, advertising pictures, employment blank, typing speed and accuracy, civil-service, terminology list.

General information as showing commercial instinct. An attempt to find observation by an advertising test. Experience not always essential for employees, but sometimes a 50 per cent factor. Distinct vocational tests to find experience. Trouble arising from foreign languages, and its solution. Wide possibilities of terminology test.

IN the chapter on Personality, emphasis was laid on the idea that facts gained by our own observation are of much greater value to us than those acquired from authority or through accepting general belief on the subject. Knowledge gained from books is essential, but it does not become a vital working force with us until confirmed as part of our own observations. The worker is of commercial value to his employer according to his knowledge of his job and of facts bearing on his job. These must nearly all be acquired by observa-

tion. The executive who knows only his own work and has not picked up a large fund of outside and *general information* has a very limited field.

A business is narrow in its scope for the single workman, but the man who gives him a job has to know a whole lot more than the details of a single bench or machine. He is the connecting link between the job and the world. He should be acquainted with both ends, and the world is a pretty large subject to know. A lifetime will give him only a little knowledge; but he must be master of this little, so that we consider this faculty an important one for managers and foremen. We tested fifty typists on ordinary topics of life to find what they had picked up outside of books. The results were surprising. Only one person in eight knew of what bricks were made. Solder was a new word to many, and we were surprised to find from one of them that it was made of "courage, perseverance and endurance." Concrete was a strange substance upon which most could give us no information whatever. There were only two difficult questions in the lot. Most of them were such as one could learn in passing along the street or in reading the newspaper; yet few could answer more than four out of the ten.

In a general information test, such as given in Chapter II, thirty-six executives made an average of 71; and thirty-five clerks made an average of 51. This by the *law of average* proves to be a distinctly vocational test. Few but high executives can make anywhere near 100 per cent. It shows a man's instinctive absorption of things essential in business life and has proved of great importance for clerks and executives.

General Information has its rating on our index card in the first subhead under *Information.*

Beside the test which we call "General Information," we have another in the same line which combines observation, memory, and business instinct. It is an adaptation of a game popular some years back. This consists in associating popularly advertised articles with certain pictures. On page 36 are shown twenty-five advertising pictures or trade insignia. The subject is asked to look at the page and put down, opposite the corresponding number on another sheet, the names of the articles advertised. Allowing one point for every correct answer and dividing the result by two gives a rating on a 10 basis. The average in this test will vary according to the age of the advertisements and locality of the test. At the time of writing it runs about 7.2 for intelligent people in New York City.* In seventy-one tests outside of New York the average was 5.3. It showed nothing significant by the law of extremes so far as employees are concerned but it would be interesting to advertisers.

Business Experience. Experience is probably the oldest test of efficiency in existence. It has been the one recognized element of importance, and rightly so. It is covered in our employment blank by the questions relating to former employment. The subject's own statement is entered up on the index card as to kind of work and time employed, while if possible a later test in the technical work claimed is entered up in confirmation.

The truth of statements answered as to former employment can be verified by internal evidence (such as contradiction), by confirmation from former employers, and by a direct test of efficiency in the work

* The pictures for this test shown in Chapter II are new and recent tests show a much lower record.

claimed. The verification of the statements may count as one or more points in the honesty record.

It has been an oft-repeated experience of superintendents to find new employees without former training come into an organization and beat all former records of old and trained help. In our investigation of thirteen record-breaking typists at Underwood's we found that when it came to weighing the factors that achieved their success, experience had to be given a weight of 50 per cent. In other words, it was of as much importance as all other factors combined, proving that it took years of training, as well as natural aptitudes, to achieve success as a record breaker. This, however, was not our experience in factory piecework investigations, where we found that in easily learned work six months was usually sufficient for the worker to attain average efficiency. In work which requires only a few weeks to learn, the employer may do himself great damage by making experience the main factor in his hiring of an employee; yet this is often the principal consideration even with employers whose work is quickly learned. Some executives even go to the opposite extreme with marked success, one manager of a noted sales force preferring to choose and train his men from raw material.

From these cases it must be judged that every vocation has to be separately analyzed and its appropriate weight assigned for this experience factor. It varies probably in direct proportion to the time necessary to learn the job. The data we have collected, however, are not conclusive and are applicable only to the particular jobs we dissected. Except in work hard to learn, no experience factor which we attempted to apply resulted in anything but a serious disturbance

to the results of the other tests, showing that it was not vital; but in jobs intricate and difficult to learn, it is evidently an element which must be calculated.

In computing experience factors the time element can be ignored entirely if a set of standard tests can be originated for particular jobs. As an instance of this, we made a series of tests on forty typists to find what was the average efficiency to be expected in that field. We took records of speed and accuracy in typing and of accuracy in stenographic work, securing the following data:

The average speed of typists from copy is 38 words per minute.

The average accuracy of typists from copy is 97.7 per cent.

The average accuracy of stenographic reproduction is 95.9 per cent.

Counting twelve words to the line, this last record means that on the average one error occurred in every other line. For simplifying ratings 1 per cent was deducted for an error in spelling, capitals, punctuation, or spacing. Subjects making over 10 per cent of errors were not considered in the average since they could hardly be called typists.

In taking such records as these the average depends largely on the conditions you make. These tests were all of subjects without a job at the time. In ordinary business, the speed, according to tests made at the Curtis Publishing Company, does not exceed 14 words a minute, but the accuracy is much greater owing to the acquaintance which a typist soon acquires with the terminology of her employer. The reason why the speed is so astonishingly less in actual practice is the lack of the competitive stimulus, present in the above

test, and the fact that most employers have no *interior standard* of work.

Below will be found five highway-inspector experience tests from a New York civil-service examination, which will exemplify the very good work of most government examiners in this line.

What are slope stakes and how are they set in staking out highways?

How would you determine the value of road metal by inspection in the quarry or gravel pit?

What precautions should be taken to insure the stability of a road built along a wet clay hillside?

What causes led to the introduction of bituminous binders for highway surfacing? Explain their purpose and describe a method of applying them.

What are the distinctive characteristics of trap, limestone, gneiss and slate rocks; and of yellow pine, spruce, hemlock and red oak lumber?

The above examples are typical of what can be accomplished in all experience tests. Any manufacturing enterprise with a steady output of a standard product can standardize the time and accuracy in producing one or more units of that product, and have a machine set aside for the use of the employment department to try out applicants on the work of the unit with which they claim familiarity or experience. For instance, the machinist can be tested by the selection of the tools to do his work, by the time of setting up a standard piece, by the time and accuracy in making his cuts, taking out and laying his finished product on the bench. The bookkeeper can be tested by making a set of standard entries in a dummy set of books as shown in Chapter II. The weaver can be tested by

his speed in knotting a hundred threads on a dummy frame. In fact, a little ingenuity on the part of an employment expert will enable him to find some means of originating an experience test wherever necessary.

Languages are generally acknowledged to be of little commercial use unless acquired by actual life contact. Their importance in any work on Labor Standardization consists in the fact that they have to be considered, since nearly all our manufacturing in this country is now done by the imported foreign element. A foreman has to be either a versatile linguist or an expert motion artist. Many million dollars' worth of work is spoiled yearly in this country through the inability of our foremen to convey some delicate phase of thought into a foreign head. To overcome this difficulty, some factories have classes in English while others have made arrangements with the public school authorities to have their employees taught during certain hours; so the discussion of this subject is by no means academic. In fact, it is one of the greatest problems confronting the standardizer, for it is essential to him that he be able to talk to, or to make the foreign worker understand him. Personally, the author is good on imitation, but foreign grammar has always been an unfathomable mystery to him. For some time he had to work through interpreters and the tests on foreigners were useless, but the reason of failure was finally discovered. The interpreter he used was a bright girl who could speak most of the foreign languages but, since our work is largely class work, the difficulty seemed to consist in testing several nationalities at the same time. When classes were made of but one nationality the results came out with almost the certainty which we had already acquired in Eng-

lish. The interpreter did not take the words sentence by sentence, but learned the complete system of tests and put them through without any interruption from the author. If these points are observed, no special difficulties will be met in testing the foreign element with an intelligent interpreter assistant.

As to rating the language element for a given job, it is only a problem of the expense in teaching the employee; since after the job is once learned it is not much of a factor.

Language must of necessity be a factor in commerce, where a firm deals with foreign countries or foreign customers at home; and where it is an element of a job, the standardizer can have two foreign letters written by a language professor and translated into English. These letters can be given the subject to translate, one into English and the other into the language under test. By this means the standardizer can test his subject without being himself a linguist. As an easy test we asked fifty subjects to translate the single sentence, "Time waits for no man," into as many languages as they knew. For ordinary purposes this is enough of a test unless the subject is to have constant contact with a certain language. Under the heading, "Languages," in our index card, each language can receive its special rating.

Terminology lists are a means of finding a subject's acquaintance with the terms in any line of business. They cover a wide field of information regarding a person in a very short time. If a man professes to be acquainted with the shoemaking line, a test as to his knowledge of the trade terms of that business will soon tell whether he is bluffing or not; and so it will in any profession. If a subject gives a list of places in

which he has been employed, a terminology list will tell whether he has profited thereby and may even tell that he has been lying. Such lists also give confirmatory ratings on general information, as they may be made to cover a wide range of terms. If the subject under test cannot spell well he will have to be asked what the terms mean. If he can spell, his ability to recognize the words is usually all that is necessary. The list shown in Chapter II consists of the terms used in a number of professions, the most of them being wrongly spelled. If a subject is fairly educated he will be able to cross the wrongly used letters, provided he knows the vocation. This test is so arranged as to minimize the time factor both of the subject and the standardizer. It can be given in class work, and since no definitions or words have to be written out it can be made quickly and rated almost instantaneously by placing a correctly marked tracing cloth or celluloid sheet over the copy. If the subject's record corresponds with the record on the transparent marking sheet, he is correct. If the subject had to write out all these words, the difficulty in interpreting ordinary writing would make this such a tedious job as to tempt one to abandon it where time is a factor. This test at the same time gives a spelling rating.

One can easily see that in testing a stenographer for a certain job this record is almost a necessity. A stenographer who got only two of the electrical words and the whole ten real-estate terms would certainly cause profanity for a time in an electrical concern while she might be a treasure for a realty man. In fact, we have found in actual tests that a good typist is utterly at sea if she does not know the terms of the business in which she is working.

Terminoloy lists may be made to reveal other things, as the discerning can figure out for themselves, as for instance the sporting, religious and social proclivities evidenced by familiarity with the relative terminologies in the example given.

The one hundred words here shown cover a wide range. Any business can compile a hundred words especially in its own line, divided into sub-lists by which the examiner can determine a subject's acquaintance with the terms of various departments in the line handled.

Ratings cannot always be taken on a terminology list according to the apparent mark made, but often consist in a ratio between the record of the whole list and a particular list. The highest general record made in this test was 95, achieved by an editorial proofreader, indicating that it would be an excellent test for printers and copy readers. The average among intelligent people runs about 86. The averages were not computed on exactly the same words we have given, but the same classes and elements were used, so that they will probably not vary materially therefrom.

Chapter X

HEARSAY (AUTHORITY)

Education and Reading, Mathematics, Religion

Tests: Employment-blank tests for authority. Education tests; grammar, composition, geography. Adding test, patient analytical detail test, ethical test.

Application to stenographers, correspondents, insurance agents, and bookkeepers.

Parents the final authority to small children, teacher as authority, text-books as authority. The superstition of the printed page. Print a great influence. Popular leaders as authority. Authority a component of many qualities. How education average is reckoned. Sentiment and prejudice for and against education. Education a weakening influence. The well-balanced race. Power of visualizing in mathematics. Relation of religion to business. Moral state of factories. Jewish factor in business. Honesty, breaking point in honesty. Fidelity-company methods and their success.

ONE of the greatest influences in the formation of character is the relative subservience to authority. In the business world it has been given recognition only as obedience to orders.

Authority with almost equal justice can be made to take the place of hearsay as a main source of memory, for education, reading, and popular opinion become authority for beliefs or facts of memory in all minds. Our only excuse for not making this subject a main

feature of our analysis is that *hearsay,* as shown in our diagram, is more directly in antithesis to life-contact knowledge. As we have formerly noted, all authority should be classed as hearsay unless verified by experience.

We would define "authority" as a *foundation for belief.* One of our humorists has said that up to six years of age he thought his father was the infallible exponent of ultimate knowledge. Between six and twelve, things happened to undermine this faith. Between twelve and eighteen he was entirely disillusioned and found out his father was a back number and knew nothing at all. When he reached twenty-five he grudgingly acknowledged his father must have known something. When he reached forty he knew his father was the smartest man that ever lived. Here we have an illustration of authority. To the small child the parent is the foundation of belief, for the baby looks to his parents usually as the basis of all knowledge outside of his experience. At the earliest age a baby, however, will back his own experience against the hearsay assertions of parents—for example, when a parent tells a child continually that it will be punished and then never carries out the threats; but outside of such actual experience, the babe places implicit faith in its parents and will believe the most fabulous fairy tales. When the child goes to school the teacher becomes the principal source of authority and the printed page is the fountain of "truth." With nine out of ten pupils, in our observation, the teacher and the printed page of a text-book are final as a basis for belief even to the end of a college course. A boy who can doubt such source is looked upon with pity by his associates. You will note the importance of this; for many

fallacies instilled by text-books and professors become "facts" of memory upon which the boy is going to base his future actions. Fortunately, school knowledge is usually correct, but for real advance in civilization we have to depend largely upon the one boy in ten who doubts.

People are almost superstitious in their belief in the printed page as an authority, and the manufacturer attaches too little significance to the immense influence of printed mottoes through his works, and of the insertion of some printed truth in the pay envelope. Such efforts to control opinion would be almost infallible were it not for the one workman in ten who has the independence to disbelieve and to formulate an opposite wave of public opinion which may become just as strong a basis of authority. The United States Steel Corporation is using the printed-word idea in its "Safety First" campaign, by impressing safety mottoes on the minds of its men through stereopticon exhibits at the factory gates at night. The superstition of the printed word is at the basis of all advertising. The printed word sways the popular opinion in newspaper and magazine articles and is the root of the insane political warfare against big business.

Other sources of authority are popular leaders, as illustrated in gang leaders, labor leaders, politicians, etc. Still others are priests, preachers, and religion; and finally, should be ourselves and the facts of our experience, although this last would change our analysis.

As a test for a person's reliance for action on authority, the answers to the questions of belief on our employment blank will prove valuable; and the answers to our questions in the personal opinion test, in Chap-

ter II, will show, with the greatest precision, an applicant's reliance on this element of authority.

In business life the importance of this subject lies in its influence on an employee's obedience, in the credence he will give to labor disturbers, and in the independence of his mind in working out new problems. One who is accustomed to accept authority is inclined to be more obedient than one of independent thought. By wise control of this factor the business world could formulate the thought of its employees so that it would be beneficial, instead of detrimental as it now often is.

It s said that by instilling faith in the *authority of religion* Russia sways its army, and by instilling faith in the *authority of the State,* Germany sends her millions to the sacrifice. Coercive authority can rarely be used in America. We have to be hypnotized at least into the belief that we are moving of our own free will, although we rarely do so.

Authority is a component entering into nearly all the mental characteristics. In our diagram it may be considered a calculable factor entering into everything placed to its right. It, or the lack thereof, is especially strong in *reasoning, imagination, egotism, ambition, will, accuracy, reliability, invention, disposition,* and *executive ability.* In our index card it receives its direct rating under "Obedience;" and under "Egotism" as a negative factor thereof.

In relating authority to the memory basis of personality, it has its importance in the credence which we give to the "facts" recorded in our mind. It can be estimated very closely mathematically by the question-and-answer systems which we have outlined in the employment blank.

Some interesting questions are open for solution in

this subject: for instance, is the person who is susceptible to popular opinion equally influenced by leadership of strong personalities, or by the printed page, or by religion? What weight has authority in compiling records for the various characteristics?

The greatest and most dependable source of authority, outside of ourselves, is education, and it requires our first consideration under this head.

Having already treated knowledge from the life-contact view, we will accept the common idea of "education" as "knowledge acquired from books and teachers." The boundary line between *life-contact knowledge* and knowledge acquired by reading or other authority, or hearsay, is not distinctly defined. The things we learn in school do not stay with us usually unless we have some use of them in after life. Our "education" was a quick cramming of the "facts" of life into a youthful brain, all of which we forgot unless our reading or experience called them up again, in which case they became in a large measure *life-contact knowledge;* so that, while theoretically we can make a distinction, in actual practice *book education* and *observation* become mixed in our minds.

In order to save time in tests, we usually take our ratings in composition or grammar and in writing from answers to other questions in the employment blank; in spelling, from the terminology list; in geography, from terminology and from the geographical problem in the "Patient Analytical Detail Test" of Chapter II. No strictly educational tests are given except where needed.

We made some tests as to the influence of education on the work of forty typists who were applying for a position. By the use of the law of extremes the un-

educated and the educated made the same speed records, showing that it did not affect the rapidity of their work when they wrote from copy. However, when we came to test their ability at stenography, education was found to be a very material factor in a ratio of approximately two to one in favor of high intelligence. This is obvious from the fact that the stenographer has to have a large vocabulary, which can be acquired only by experience either in life or book knowledge. A large part of our hearing ability is based on a knowledge of what our companions *should* say, rather than on our perception of the actual sounds, so that if a stenographer has not the knowledge of educated language and technical terminology, she is all at sea in reproduction, and anyone who has experience with stenographers will recognize this immediately.

Education is an important factor in all branches of clerical and correspondence work, and for this reason many firms are setting examination standards in this line for employees, notably the National Cloak and Suit Company, the Curtis Publishing Company, and nearly all the life-insurance companies. The civil service tests are nearly all pure tests of education. These examinations do not differ materially from school methods, except that the test in composition is usually a direct application to the business. The National Cloak and Suit Company makes an applicant answer a correspondent's letter asking questions about the company's line of goods. The Curtis Company asks the applicant to write a letter to a discouraged agent. Mr. Sherwin Cody, of Chicago, has compiled a series of tests in this line.

Where school education is an important factor, tests are of such nature that any well-educated person can

compile them, and the ground has been so thoroughly covered by others that it is not necessary to give examples of such tests here.

In compiling averages for education we allow 2 points for the ability to read and write as indicated by the answers to the questions, 3 more points for a common school education, and 2 points additional each for high school and college, with a final point for extra graduate work or business courses. It will be seen that we concede here the popular definition of education, and that the points are allowed regardless of how much actual knowledge the subject has absorbed. Under the system of testing the tests, according to the law of extremes no weight is given to any quality which a trial has not found essential to a particular job, so that a record of 10 for education may not even be given consideration if it is otherwise covered, or if the vocation is one not requiring education. Thus we have a definite law to solve the side of this question which is usually determined by sentiment or prejudice.

Before leaving this subject it is necessary to discuss it from this very standpoint of sentiment or prejudice. The latter element is exemplified by a man we knew who achieved a high place in the railroad world—but he had to do it surreptitiously, fearing the while lest some enemy discover that he was a college graduate. The sentimentalists, at the other extreme, almost deify education and are embarrassing the business of this country by extreme laws endeavoring on the one hand so to educate the youth of the nation that it will not stoop to anything but sweet and clean antiseptic jobs, and on the other hand striving to shut out the uneducated foreigners who are our only resource for the dirty jobs, if they succeed in their first ambition.

As to those who are prejudiced against education, they have often had some bitter experience in which an educated man has made some costly mistake due to his lack of the life-contact knowledge. In our manual-training course we learned to mortise and tenon the studs and sills of a house, but we found later in actual practice that these were always nailed together. We learned at school how to calculate the stresses in beams. We found that in actual business these are usually taken from tables. We tested a mechanical draughtsman on a problem of the waste in cutting out a pattern from metal plates. He used intricate processes and class-room formulae and at the end of half an hour gave us an answer *nearly* right. The *correct* answer could be given in a minute by a short-cut rule.

Such experiences as these prejudice some men against education. They are faults not so much of education as of *some methods* of education, and we believe that experience proves that the usual high school and college graduate will go further than the uneducated, practical man, even in the mechanical world, after he has once had the necessary practical experience. Since college graduates are few in comparison to the population, it is significant that so many managers of large corporations are college-bred.

Outside of mechanical lines there can be no doubt of the value of education, especially in some lines of salesmanship, as witness the following statistics of insurance agents, compiled by Mr. Edward A. Woods.

Average salaries over	$25,000	$10,000	$5,000	$2,500
Number of men rated	8	58	111	143
Attended college	5	16	43	50
Did not	3	42	38	54
Had high-school education	8	39	81	104
Had not		19	30	39

It will be noted from the above that 100 per cent of the men earning $25,000 and over were high school graduates, while the men earning $2,500 to $10,000 ranged about 70 per cent of high school men. All of these men were among the best in their companies and it is significant that they were so well educated.

It is probable that these men dealt largely with an educated set of people, and it would be interesting to know the statistics of the men who handled the less educated element; for theoretically at least, a salesman should usually be typical of the class to whom he sells.

Turning again to the idealists and their efforts to educate the race, we believe that both the business world and the nation have much to fear from them. It will be generally conceded that no one under eighteen should work over eight hours a day and that children should have school privilege up to ten years of age. It will even be conceded that education should help on any job; but unfortunately as a rule the children who go to school until they are sixteen years old utterly refuse to do manufacturing work and insist on entering the lady and gentleman market, where there are not enough jobs to go around. In one establishment employing a thousand hands we were able to find only one boy with sufficient education to help take some statistics. In this same establishment the vice-president offers three or four times the usual wages to educated boys to learn the menial jobs so that he will have superintendent timber for the future. The conditions here were about those usual in most of our manufacturing plants where our educated boys cannot be persuaded to soil their hands.

There is a further fact to which we should give

serious attention. Education, according to the cartoonists, has a tendency to weaken the physical constitution, the professor being usually depicted as a thin, stooping man with glasses. Evolution confirms the cartoonists in this, since animals from the beginning of time have always grown weaker in the members for which they no longer have use, so that as time advances a race which uses its brains and neglects its arms and legs will naturally become weaker physically.

In apparent confirmation of this we compiled some weight statistics from the Medico-Actuarial Mortality Investigation and compared them with the records of Columbia freshmen compiled by Dr. George L. Meylan, with the following result:

Age of men	17	18	19
Number rated	206	317	267
Columbia freshmen weight	128	128	133
Actuarial-Record weight	135	139	143

The variance shown here, however, is not so wide as it appears since the Columbia subjects were wholly stripped and the Actuarial only partially stripped, accounting for 5 or 6 pounds. Further, the Columbia records were made usually at one season of the year while the Actuarial were not so confined. As to weight in comparison to height the college men also made a poor showing. Their average heights were as follows: 5 feet 7.2 inches; 5 feet 7.4 inches; 5 feet 7.5 inches. According to U. S. Army standard, men of this height should weigh from 134 to 141 pounds and many students would be rejected on this basis. Making all allowances, students will probably average less in weight

than men of their age unless systematic physical training is included in their course. Where such training is given they may even average heavier. Columbia University evidently recognizes this and gives such training.

Probably the ideal race consists of a strong physical mass of the people balanced by an intellectual class, and nature will much better take care of this than man-made laws. We have often been compelled to take foreigners and reject Americans in heavy work where we would have preferred to have given the latter jobs. This was owing to the physical inferiority of the applicants.

We hope we have made it clear that we believe in education, and we feel sure that there would always be enough desiring education to make the happy mean of a strong physical body of people with an educated element to guide. This could be done without forcing high education on those who do not want it.

The idealists with their extreme educational laws are forcing on us a fragile race, thus hastening the day, probably inevitable, when we must go where all super-educated races have gone.

Mathematics

Mathematics is treated at this point as a sub-head under Education. It is one of the few things in which we can bow absolutely to authority, and yet not class its dicta in the realm of hearsay. It is a relief to have something absolutely dependable in this life.

While some of the other characteristics essential to business efficiency need an explanation of their application, this topic needs no survey of its use.

Nearly all firms that are giving standardizing tests have examinations for this subject. We will, however, discuss why mathematical ability varies in people, and show means of reducing examinations to a standard basis. This subject, obviously, is of more importance where calculating machines are not used.

If a business man is hiring a bookkeeper he should get one with a natural aptitude for the vocation, as such an one will often do twice as much work as one who has had the work forced upon him.

Few realize the elements that enter into a natural calculator. One would suppose that reasoning ability was essential, but we have not found that bookkeepers range above average in reasoning. If they do, they advance into the realm of expert accountants. The main essential to a good calculator is memory, the ability to remember combinations of numbers, and to visualize results from past performances.

Let us explain what we mean by this: When we see the word "on" we recognize it and can pronounce it without any mental effort, such as spelling out the letters. Likewise, when we see the formula 2 + 3 we recognize, without any mental process, that this means 5, because we have seen it so often. We get at the result by memory rather than through the process of adding. Again, those of us who are more expert in figures visualize 9 + 7 as 16 without mental processes, while those less expert will have to calculate it. But the very expert calculator can visualize 4 + 3 + 7 + 5 as 19 without mental effort, and few of us can do this. He has had that combination often before, and having a good memory he knows the result without calculating. He visualizes it just as we visualize the word "duck" and know what it means without spelling it out.

Carrying this a step further, we can conceive of a man with a wonderful memory who can visualize the result of a column of ten single figures or integers, and with this type we have arrived at what is called the mathematical freak. In other words, ability to calculate quickly is probably bound up in this visualizing memory factor, together with quick mental action.

If this conclusion be correct, a man of good memory who is now an indifferent calculator can possibly become almost twice as proficient by learning to visualize four figures at once as well as he does two. To assist in this he should memorize the additions of all numbers with a result less than twenty, for with a little thought and trial it will be found that this is one of the factors entering into the problem.

As a further help to speed in calculation, all those whose lives are centered in this work should know, if possible, the multiplication table up to 20×20, and they should further memorize the table of the single integers from 1 to 9, until they know it up to 9×99. Ability to do this will enable them to multiply and divide by two integers at once, thus almost cutting in half the ordinary time used in calculations. This, no doubt, is a great feat, but we call attention to the possibility, and, if it cannot be done by many, those who can accomplish it will add materially to their value.

Most of our calculations in life are with the smaller numbers. We use 2 much oftener than we do 9. That is the reason more people will visualize the result of $2 + 3$ than can visualize $9 + 7$; but as our sphere of calculation increases, so should our sphere of visualization, and it does not seem unjust to us to demand that a man who specializes in calculation should know a

larger multiplication table than the ordinary schoolboy.

As to tests in this line, it is not necessary to test visualizing ability as this will come out in a speed record; so it is our custom to give 20 columns of 10 integers, or single numbers, the whole to be added in 60 seconds. This test is shown in detail in Chapter II. Very few can do this; and it is best in all tests of this character to give more than a class can do, as the time element is an important factor in all examinations, from the standpoint of cost in taking them. By giving more than it is possible to do, the number of results found by the subject under test forms his record in speed, without any further calculation; and anyone who has examined test papers knows that calculation is a great time-waster for an examiner. An average compiled on one hundred subjects gave 8.4 columns out of 20. The subjects were all clerks and executives but seven. Only one subject made all 20. A class of thirty-five railroad clerks made 8. A class of thirty-six railroad semi-executives made 9 and the highest class record has been attained by ten of the U. S. Steel Corporation clerks at 13.1. Inexperienced human average runs at about 4.

The method used by most firms attempting standardization is to put down the time taken by each person under test in doing all the problems given. This necessitates a separate calculation for speed for each person, whereas the above method is an automatic self-recording test. The accuracy record should be made on the first ten columns only, and proportionately if less are done. On this basis it runs fairly regular at 9 on a maximum of 10.

As to average ability in this line, the ordinary per-

son may get only one or two, and the ordinary bookkeeper should get about ten done correctly. High executives often make very low records. The time will vary somewhat, according to the proportion of large integers used.

It is well to say here that we make it the policy in all tests not to require more than average ability, so that if a man makes only the average of his class he is considered to have done well. Thus we do not demand the impossible when we make all tests beyond average ability. This is a very important point; and while some may criticize the difficulty of our tests, it is essential to speed, since the process avoids making intricate calculations for the examiner.

To solve the time element further, it is often necessary to get a number of other records while you are making one test. The test of "Patient Analytical Detail," first given in Chapter II, is an example of this.

Apparently, the ten problems are a test in mathematics, but a good mathematician, without other knowledge, will make a failure here. The second and third problems require a knowledge of the calendar and holidays. The fourth requires *planning ability* and some geometry. The sixth requires a knowledge of the stock market. The seventh requires a knowledge of timber. The terms of the eighth will confuse a person not acquainted intimately with manufacturing problems, while the ninth requires strict attention to *detail.* The whole will show *reasoning* power. Some of them are doubtful in interpretation, requiring *comprehension* and *judgment. General information* is a strong factor. *Disposition* may even receive a rating here, as some men get violently angry because they think the lack of data is unreasonable.

The ordinary person will not get more than two of these answers correct. A subject solving five will be doing well, while a person who can get all ten without outside reference should make a fine executive if he has, in addition, strong *will power* and *determination.* We judge this from the fact that only men of good executive ability have been able to make over 70 per cent in this test. On a similar list to this we have had a class of ten clerks make less than 2, while thirty-six semi-executives made a little less than 5; these classes showed distinctive type of mind.

As to further mathematical tests, they do not require explanation here since almost any intelligent examiner can evolve them. Mr. S. A. Courtis, of Detroit, has originated standard mathematical tests which are used to measure school efficiency, and are very suitable for business tests.

Religion

Religion, as we shall see, is a vital factor in the classification of labor. If one will grant that there is a God who has directly inspired the Bible and a priesthood, then religion is the most logical basis of authority and there can be no discussion of the laws laid down, or the statements of a God. His authority must always be final. One must be able to appreciate this, whether he is orthodox or agnostic, for otherwise he cannot get the standpoint of the religious person. This discussion is purely a cold scientific treatment of religion in its very important relation to business, regardless of the reader's opinions on the subject, or our own.

Religion is a widely varying concept in different

minds. The Standard Dictionary says "religion" is *"a system of faith and worship."* To some minds it is merely adherence to the Church's regulations; to others it is obeying the ten commandments; to still others it is loving your neighbor as yourself. In our tests for a man's ability to read character from photographs, we asked the subject if the portrait pictured a religious person. We found such variances in the idea of religion that we had to change the question to read, "Is he a constant church goer?" This was rather inelegant in expression, but the only way we could get a definite answer. We are not usually satisfied with dictionary definitions, but the one quoted is concise, though vague, and we offer nothing better.

The assistant controller of a corporation told us that Billy Sunday's campaign in one of their towns resulted in a 25 per cent increase of efficiency among their workmen. Whether this is a guess or an actual calculation we are not prepared to say, but certainly such an assertion from a man whom we know to be very careful in his statements is enough to set religion as a large factor to be reckoned with in making standards for labor. Billy Sunday's work was twofold, that of pure moral reform, and the propagation of total abstinence as a by-product thereof. Possibly the latter was the greatest factor in the production of efficiency. However, we need no special analysis of just what moral quality produced results in this case, for religion is an old and recognized element in choosing employees; in fact, a matter of pure prejudice in some towns. Some foremen, under the old method of employment, even in our present enlightened times, are allowed to select their own men and to choose them largely on religious bias. If some of the readers of these pages

should make an investigation they might be surprised to find such practices even in their own works.

The questions of our employment blank are worded to bring out religious belief and practice, together with moral habits. The question on Jonah and the whale is the ultimate test in belief in the authority of the Bible. No hesitancy is usual in the statement of church relations, though naturally few will confess many supposed moral deficiencies, fearing that confession of drinking, smoking, swearing, or lying might prevent their getting a job. Besides the direct answers to questions, facial analysis and physical examination will give further data as to the moral make-up.

As to the direct influence of moral character on the work, we have no reliable statistics as yet. We have taken a number of religious records among applicants but have not followed up these records in the work. Religions are so many and various that it will take thousands of records before anything of a mathematical nature can be evolved, but we are getting as many data as possible for future reference. Outside of this we have consulted various managers and find there is a strong effort to uphold the moral tone of employees. This, in some cases, has been almost necessary for self-preservation, as the managers declared that under former *régimes* their factories were designated as the disreputable resorts of the town, and their moral reform had to be quite strenuous if they wished any decent people to work for them. One owner told us that before he was known personally by his employees, he was subject to such embarrassment by remarks that he was loath to pass through his own works. As a means of reform, a matron was installed in the first factory referred to, and matters of discipline which a man

could not attend to were referred to her. The old opprobrium has left these works, but the other factory is still undisciplined in this respect.

A person may be religious and yet not honest or virtuous, for with many people religion is a matter of heredity, social nature, or emotions, and has little effect upon their actions. With some denominations the desire to do right is all that is necessary for membership; while with others, evidence of continued good action is required before membership is allowed, and for business purposes members of these latter denominations must classify higher than the former—since, to put it coldly, they have already had some test of religious efficiency. For positions of trust, a letter from a pastor representing one of these sects, stating that the subject is a faithful member and of high moral character, is usually conclusive as to responsibility and is so accepted by some fidelity companies. The attitude of other churches—which regard children of members as already in church relation—is possibly better theoretically, but it gives the business world no data as to the child's personal reaction toward church membership. The author asked a girl once whether she was a Christian, and she replied "no" that she was a "Lutheran." This is no reflection on that great denomination, since we know too little of it to classify it in the present discussion. As to the Jewish religion, few will have the temerity to say it is not a great factor in business life; and we have no choice as to the discussion of it if we are going to cover the ground of labor standards. Should we put a class of twenty subjects through our tests and find that one of this faith made the highest average, which is not at all unusual, we would be confronted at times with a

rule that none of this faith can be employed. This is sometimes a matter of pure prejudice and, as such, should be decried; but if it be granted, say, that a salesman should be representative of the type of his customers, and that certain customers in some sections of the country do not care to deal with one of this faith, then we cannot blame a firm for hiring only Gentile salesmen. In fact, some Jewish firms are careful that only Christian salesmen shall represent them in a certain territory, and wisely so. On the other hand, certain positions can be ideally filled by a member of this race. These questions of religion are nearing a solution, and not on a basis of prejudice, but from statistical data.

In our card-index chart we have sub-ratings under this characteristic—of *honesty, charity, virtue* and *ethics.*

There is as much difference in the conception of *honesty* as in that of religion. As to differences in conception of things, we may illustrate by taking a field of grass. To the artist this field is the foreground of a picture, to a horse it is something to eat, to an ant a mighty forest. So with honesty; to some it is synonymous with religion, to the compiler of a dictionary a bunch of synonyms. It may to some be simply obeying the letter of the law, to the politician the keeping of a promise, and to the thief loyalty to his fellows.

To the same individual it has the pliancy of an accordion for himself and the narrow rigidity of Nassau Street for others. To change the figure, our subject may use a sinuous hundred-foot tape to compass his own ingenious self, and apply a scientific foot-rule to others, with a scale divided to the thousandth of an

inch; so, for our discussion, we must define and confine the term:

Honesty in business life is *abstinence from stealing.* Stealing may consist in taking money which does not belong to us, or stealing value in time, wages, or goods, by force, trickery, or misrepresentation. A person may be religious and dishonest, for one can obey the letter of the ten commandments, or of the State law, and yet steal.

We acknowledge that this is a definition which leaves no one absolutely honest, for I have yet to find the person who will not accept unrequited value *in extenuating circumstances.* As an illustration outside of our tests, we will take the case of a country parson who had a beautiful horse and a beautiful wife and little more of earthly value. He had given $200 for the horse only to find that, while it started out on any trip with a flourish, a half-hour's run was about its limit, when its enthusiastic efforts ceased abruptly and almost entirely. He knew the horse was not worth over $25. His beautiful wife was taken ill and he hitched up his horse to go for the doctor, who was within the half-hour limit there and back. A stranger met him at the curb who seemed irresistibly attracted by the horse. In answer to the question as to whether the horse had any speed, the parson who was in great haste said, "Friend, I have a very urgent call for the doctor, but I will let you answer your own question. You may drive me there and back." The offer was accepted and the horse made a brilliant performance. While the preacher and the doctor were in the presence of the sick wife the stranger still hung about. The doctor announced to the parson that his wife's life could be saved only by taking her to Colorado. The parson re-

tired to a secret place and prayed for money. He heard a knocking at his front door. He tried to dry his tears and answer the summons. The stranger stood at his step and offered him $200 for the horse. The parson lifted his soul to heaven, gave thanks for the marvelous answer to his prayers, and accepted the money. Can we blame him? How many can say they are so flawless that the pinch of circumstance has never led them to shade the truth in a financial transaction? Show us the man, and we will proclaim the search of Diogenes ended.

This discussion is not literary persiflage, but a necessary argument to clear the ground about the much discussed question as to whether every man has his price. Under given circumstances we believe he has—and if he hasn't, he ought to have. To prove this, we will take the case of the parson again. Suppose, as rarely happens in such circumstances, that the parson's conscience had troubled him, that he was convinced that to accept the $200 was to lose his eternal soul, while to refuse it was to pass the death sentence upon his wife. We contend that the man who would be worried about his own eternal soul in such a contingency ought to be kicked out of this world into perdition anyway.

It is not such a horrifying thing to confess that we are not perfect and that every man has his price. Anyway, the truth is more important than any personal considerations as to whether we have our price or not. If we can get our minds clear on this matter we are ready to get at the meat of this question, for the vital point is this: *Honesty* is only a relative term. We cannot classify anyone as 100 per cent in honesty, but we may calculate the approximate breaking point. While most labor standards are problems in simple mathe-

matics, this goes into the higher realms. Taking 100 per cent as the impossible ideal, we may find the limit of certain individuals which will be at, say 75 per cent. This they may never attain, or they may approach till the variance is so small as to be unworthy of calculation; but somewhere in this region they will break, and sometimes they ought to break, for the philosophy of Christ's anathemas against the Pharisees lay in the fact that they carried virtue so far as to make it a vice.

The manager of one of our large corporations that sells service through thousands of employees, estimates that 95 per cent of his men will turn some of their receipts into their own pockets if they get the chance. The cash register is the universal acknowledgement that the temptation for small change is too much for the ordinary person, yet these employees all have their standards. While 95 per cent would knock down a nickel, probably only 5 per cent would steal as much as $10 at once. A girl starts as cashier in a restaurant. She enters practically an honest girl, but after a few days she persuades herself that her employer really owes her money and begins by withholding a nickel from her returns. She acquires the courage to abstract a quarter eventually, but this is often her limit.

The manager of the surety department of one of our large bonding companies believes that practically everyone has a limit, but under ordinary conditions, is honest. The president of the board of another surety company thinks most people are honest. Both companies say that not more than 2 per cent of the people they insure go wrong, but the first one says that this is simply because they do not reach the breaking point

—that the bond itself holds them to a straight path, and that to become a social outcast or to go to prison is too high a price to pay for dishonesty.

Few will deny that it is hard to find a characteristic more difficult to rate than honesty; and yet the methods of the surety companies are so scientific that they are 98 per cent true, at least in calculating the breaking points. If this is true of such an illusive trait, certainly Labor Standardization can hope in time to reach the same efficiency.

Some of the significant things bearing on a man's honesty which receive consideration, were first brought to our attention by an officer of the Fidelity and Casualty Company of New York, as follows: Race has an important bearing, Scotchmen and certain classes of Americans being the best risks. Single men, over thirty, are not as good risks as married men. Unhappy married relations render a man open to some suspicion. Incurable disease is a factor. Certain club relations denote a higher standard than others. Life insurance denotes stability. Men who own their own homes and other property are more dependable. Besides the data secured on these matters, a number of questions are asked which can be verified by correspondence to find whether the subject is telling the truth.

A reference to our employment blank will show that most of the above points are covered, and the bonding companies will usually supply blanks upon which full data can be collected on this subject.

We give below an ethical test which we submitted to sixty criminals in a reformatory and to sixty students in a theological seminary, as the best means of trying it by the *law of extremes.* Only one question proved of

value, since both the criminals and the theological students usually answered what they thought we wanted instead of what they would actually do. The one question which proved of value was No. 7, relating to the temptation of a large salary. The theological students answered this in the only possible ethical way, but the temptation was too much for some of the criminals and they revealed themselves. In its after use in business we have found, much to our surprise, that intelligent men who must know our drift, will answer this question "yes." In actual experience there is an even chance that the answer "yes" or "no" to any of the other questions will be made by the average honest man and we cannot give him a detrimental rating for his frankness, especially when he knows an honest answer may place him in a bad light. We have recently put a very short time limit on ethical questions, and the results stand out more distinctly; but so much of comprehension enters into an ethical question that we are very careful lest we condemn a man unjustly.

Ethical Questions

1. If you were about to take a trolley at an exchange point and a friend got off a car and laughingly gave you a transfer, telling you to use it, would you do so to save a nickel?
2. Would you condemn a man who was hard up for using the above transfer?
3. If you were traveling by rail from New York to Philadelphia with a child seven years old who looked to be less than five (which is the free traveling limit), would you try to get him there free?
4. Would you condemn a workman with six children for

trying to get some of them through to Philadelphia free who were above the age limit?

5. If you caught your grocer continually making out his bills wrong, so as to cheat you, and then found one bill where he made a dollar error in your favor, would you call the mistake to his attention?
6. A cashier had an invalid wife and could save her life only by an expensive operation. He tried to borrow from his firm and others but failed. He was confronted with the choice of either letting her die, or taking the money from the cash drawer. He took the money unknown to the firm. Now suppose he repaid it without being found out. Would you condemn him for his action?
7. If you were a good salesman and a promoter offered you $20,000 a year to sell stock in a company which stock you knew to be valueless, and you were afraid the company would burst up; would you take the job, provided you got a good guarantee?
8. A salesgirl in a store was ordered to tell customers that garments were all wool when they were really half cotton. The girl being afraid to lose her job, did as ordered. Would you condemn her action?
9. A steel company issued some stock which has paid good interest and has given the buyers good value for their money, but it is what is called watered stock, from the fact that it cost the trust only the price of water, or nothing. The money which they received by selling this to the public was all pocketed by the organizers and did not go into the business. Do you think they were honest to issue such stock?
10. An employee was hired and did average good work. He was just about as good as the ordinary run of people employed by the firm. After he had been employed a year it was found he had lied in his employment blank. Would you fire him if you were the boss and found this out?

Chapter XI

POPULAR OPINION AND PERSONAL OPINION. THEORIES

Tests: Personal opinion, initiative, invention, and theories. Application to executives, stenographers, technical men, buyers, salesmen, millinery saleswomen, and politicians.

How the common type of mind works. Executive correspondence to popular mind. Idiots, semi-chaotic types, subnormal, normal, intelligent, and executive types. Methods of finding correct answers to questions. Popular opinion and its effect on business. Causes of failure. A vice may be a popular asset. Controllers of opinion. Definition of theory. Three classes of theories: infallible, high average, and wrong average theories. Business and social theories. How to test theories of employees.

PSYCHOLOGISTS have classified people principally from the mental deficiency side. We are more under the necessity of classifying them from the mental efficiency side. Their view has been somewhat negative while ours is positive.

The classification of people according to their *general* mental type rather than in a *particular* sense is an important part of our work, and we believe that the results have come out very distinctly. Our method is very simple, consisting in obtaining and studying the answers to a number of the easy questions before referred to in the employment blank, and representative of a number of the popular beliefs of the day.

You will note in the blank a set of queries beginning with "I believe in." Now, the answers to these questions will very distinctly classify a mind as to its conformity to executive, popular, and other types of mind; and will give a very good psychological analysis of a personality. This set is selected and enlarged from thirty questions, for which we have ratings compiled, and is arranged so as to get a record with the greatest speed possible, no written answers being required, only lining and underscoring. It might be possible to find how a man's mind works by giving him a set of hypothetical questions to answer, and marking him according to your own wisdom; but your success would depend on your own fallibility. Every question of the day should require some mental process in its solution, and, if no cerebration has been used in solving these, we naturally suppose none will be used in a man's business life; so a fairly accurate rating of a man's judgment or "following-the-crowd" tendencies can be secured from his answers to these questions, and a record made of other qualities as well.

In order to find out how the common type of man thinks and how the executive type differs from the common in mentality, our questions were first formulated as follows:

Personal Opinion Test

Do you believe the following?

1. That war is ever justifiable. Ans.
2. That to "love your neighbor as yourself" is a better guide than obeying the ten commandments. Ans.

3. That most people are dishonest if pushed hard enough. Ans.
4. That government ownership is best if it gives far greater happiness. Ans.
5. That private ownership is best if it gives the greatest happiness. Ans.
6. That moral laws would be necessary if all people were moral. Ans.
7. That women are kinder and more humane than men. Ans.
8. That you are above human average in ability. Ans.
9. That you can infallibly tell character by appearance. Ans.
10. That the United States gives more personal freedom than any other country. Ans.
11. That the Democrats are morally far below Republicans. Ans.
12. That the Republicans are morally far below Democrats. Ans.
13. That women are incapable of voting. Ans.
14. That women will make better laws than men. Ans.
15. That trusts are a great evil. Ans.
16. That the account of Jonah and the whale is true. Ans.
17. That the majority is always right. Ans.
18. That perseverance will *always* bring success. Ans.
19. That implicit obedience is the greatest business essential. Ans.
20. That everyone has equal opportunity for success. Ans.

Do you believe it can ever be possible to do the following things?

21. To build a tower ten times as high as the Woolworth Building? Ans.
22. To furnish wireless power to aeroplanes? Ans.
23. To foretell with 98 per cent accuracy what a man can do by mental and physical tests? Ans.

24. To transmute gold from baser metals? Ans.
25. To invent perpetual motion? Ans.
26. To invent good tide motors? Ans.
27. To invent good wave motors? Ans.
28. To invent good sun motors? Ans.
29. To tunnel from Alaska to Asia? Ans.
30. To find an old-age cure? Ans.

One hundred of these were presented to some of the chief executives of the country with a request for their answers. Only a few replied, but enough were received for our purpose. Against these we presented the same set to a number of people in the ordinary walks of life. The result came out very distinctly. Judging that the executives were the most likely to be correct (from the fact that most of them had attained their positions by being right most of the time) a vote was taken as to their decision on these questions, and such vote fixed as 100 per cent in rating.

Our questions were presented mostly to famous business men, but we gave Messrs. Wilson, Roosevelt, and Taft a chance to express themselves also. Needless to say they turned down the opportunity; for while apparently a republic has a right to know what its leaders believe, they will not usually express themselves unless they know they are in accord with popular opinion—and one cannot blame them, for their success depends on this. We will speak of this further, since it has a bearing on the importance of these tests, for popular opinion is a very important factor with which the business man has to deal in selling goods as well as the politician in getting votes.

As to the results of this test, only one executive made as low as 56.6, the range being from 56.6 to 86.6, the average running about 73.3. Those below the

executive class ranged from 16.6 to 76.6, over 25 per cent making less than 40. Out of a class of twenty-three applicants for a typist's position, not one made higher than 56.6 in this test. This showed that the highest type of mind in this class only reached the lowest type of executive, since it just reached the minimum executive record. They made an average of only 41 among themselves, as against 73.3 for executives. The 73.3 average was attained by thirty executives and technical men, and by thirty-six railroad semi-executives; thirty-five railroad clerks and stenographers making 58; *and ten executives and technical men of the Emerson Company making* 87.

Another strange fact that became apparent was that the executives knew and represented popular opinion much better than the populace themselves, though this may appear a paradox. When we let popular vote decide the questions, only two executives made lower than 60 per cent, their averages running from 46.6 to 70 per cent. The average of executives in representing popular opinion was 62.4. The average of the populace in representing their own opinion was 57.3, ranging from 18 to 73.3, and subtracting the executive weighting from the list they made only 54.5. This looks like an an impossible mathematical result, but it is correct, and comes from the fact, mathematically, that executives have the same chance as the populace in making the general average of 57.3 per cent, and to this their judgment may pile up a higher record.

Some interesting points arise here. According to executive decision, people are right only 41 per cent of the time. According to their own decision, they are right only 57.3 per cent of the time. Averaging the two, they are right 49.1 per cent of the time, which

record they could make by the laws of chance. Where is the vaunted mentality of the human race?

The results bring out three other points: First, executives decide questions in a clearly defined manner, and this manner can be determined and rated by their answers to popular queries; second, since popular opinion is a decided factor with which business men have to deal, either in knowing what goods to sell or in handling men, the ratings show that the best executives are those who in themselves have the instincts of popular opinion, as indicated by their answers; third, if a politician wants to know what to do let him ask any first-class business man!

We do not believe the importance of the popular-opinion test can be overestimated. It portrays immediately a distinct type of mind. You will note that, mathematically, a person without any judgment, marking the list haphazard, can get 50 per cent, if he simply makes a definite answer. In this lies the significance that nearly all the popular averages ranged about 50 per cent, showing no effort of thought in the ordinary mind.

Those who claim that a map of the human mind can never be made would change their ideas if they worked on many of these lists. Much of the mystery with which people regard the workings of the brain will be lost with experience in these markings, for the one type of hopeless ordinariness comes out very distinctly. It has no range of thought and its action under given conditions can be foretold with almost unerring accuracy. With proper drilling it can be taught to think almost anything that does not require the trouble of real thinking, and to do almost anything up to its very much limited limit, with given incentives; and there is

no necessity for the general vagueness in the business world as to how to judge and handle it. Having found this type of mind, the problem is no longer that of the person but of the job, which latter must be analyzed and must be of such simplicity that the ordinary type can handle it; otherwise a higher type will have to be secured.

One would think that this species of mind was bad enough to handle in commercial life, but there are two even lower types before we get to absolute incompetency. The next lowest is the type who look at these questions in a semi-hopeless state, yet will make a fair effort to answer. The lowest type is the one whom a presentation of these questions will daze into helplessness; about 10 per cent being thus utterly incapable of escaping from their hopeless mental chaos.

From the ratings obtained by us we find six classes of mind. The first would be the *idiots* who would be unable to comprehend even the idea of answering. The second would be those who would comprehend some questions but whose minds are too confused to answer, yet who are capable of learning simple work. These would make zero. We will call them *chaotic types.* The third would be those who could answer only about half. These would range in average from 16 to 25 per cent, and might be called *sub-normal.* The fourth constitutes those who can comprehend and make distinct answers, but whose judgment is yet haphazard and thoughtless. They would make from 25 to 55 per cent, and their answers could just as well be given by tossing a coin on each question. These constitute the great mass of humanity, and as such may be called *normal types.* The fifth or next highest is the distinct class of intelligent persons ranging from 55 to 65 per cent.

We would hardly say that these people used much more thought than the normal type, but their opinions have been formed by reading and the higher schools, so that they can be used in positions of responsibility, since they know enough to consult or depend on good authorities for decisions. These may be called the *intelligent type.* The sixth and highest type ranges theoretically from 65 to 100 per cent, although we have found only one who made the whole 100 per cent. This class constitutes those who are capable of independent thought and decisions regardless of precedent or authority, and may be called the *executive types.*

The fact that a person may classify only as normal in this test and yet be an executive does not disprove the test. He may be unfit for his position, or he may have some other distinct quality that raises him to the executive class. On the other hand, a man may classify in this one test as an executive and yet he may be incompetent. As we have before emphasized, no one test of qualities is ever conclusive for a given position; hence we usually use a number of tests. We know of one man who can classify as only a normal type, and yet he has achieved success through sheer persistence. Men deal with him not because he can intelligently convince them, but because he is insistent and will not take "no" for an answer. An executive may be but normal yet achieve success through his driving qualities. Again, the popular type of man may make a very good salesman if his arguments are prepared for him; and, being of the normal type, his fellowship with his customers will be on an easier basis, since he will find most of them of that type; and, for this class of mind, the real argument that counts is "the crowd." If a salesman can convince a man that everybody else is

buying his article, the sale is usually won on this rather than on the merits; hence the common sales policy of quoting many well-known customers. The normal type of mind can make this appeal even better than an executive type.

The averages quoted above are based on the poll of the executive vote, the twelve most successful men of all the people answering our questions constituting the jury. Among these were Mr. Edison, Mr. Harrington Emerson, the efficiency expert, and Mr. Nisbet, also a high authority on efficiency. The most were too modest to allow the use of their names but they were of the following standing: one of our great watch manufacturers, possibly our greatest hardware man, a famous restaurant man, two noted manufacturers, a wholesaler, a cereal food man, and two other efficiency experts.

As to a direct application of these records to our characteristic chart, we would enter up the average for executive opinion under the executive heading opposite the sub-head "Decision," as this will be the rating on the ability to decide questions correctly. We would then enter up a subject's correspondence to popular opinion under the "Human Nature" heading opposite the sub-head "Opinions."

While these records were taken on the thirty questions especially prepared, the answers to those questions on the employment blank can soon be determined in the same way by any firm taking the records of their employees and of applicants for positions. We would be glad to tell what was the vote on the answers to our questions, but this would destroy the pleasure of the reader in trying himself out. Any good-sized plant can determine the approximately correct answers by

taking a vote of its highest executives. A manager can find the relative correspondence of his staff to his own type of mind by marking the answers according to his own decision, but the wisdom of such policy is doubtful.

Popular Opinion and Business

Popular Opinion, right or wrong, is not only the best means of finding a quick general rating on people, but is one of the great factors with which the business world has to deal. The opinions of the populace pull down or build up business through the Government. The opinions of the workmen build up or wreck a business through content, indifference, or strikes. The opinions of the customers determine the success or failure of anyone with a product to sell.

In the January, 1916, issue of *System* it was asserted that approximately 50 per cent of failures among merchants was due to the loading of shelves with dead stock. If this be so, it is significant and vital. Their failure was due to misjudging the popular opinion. It is not only with questions of belief that the business world has to deal, but also questions of personal taste in every commodity where taste is an element. In view of the great importance of this subject, it is strange that it has not heretofore been given more study, and a little inquiry will point out means by which much can be accomplished in finding the popular attitude. It is often a great commercial asset not necessarily to be right, but to be representative of the crowd. If you have a popular product to sell, are your buyers and salesmen representative of popular taste? This opens up one of the most important branches of

test work which we have to present, but it will be taken up more in detail when we analyze artistic sense. Tests in this line are very conclusive and simple. We will forestall our technical treatment of the subject by saying that our general method is to get a record of the best sellers in any line of goods, and then test out buyers and salesmen as to their preferences in these lines. Out of ten selling products it is not unusual to have a good buyer or salesman pick out the five best sellers as approved by his personal taste, without knowing what we are getting at.

As to the application to a sales force, the test can certainly be varied to suit any line of goods. A department store may have wax models of ten types of heads and hair, and then ask a prospective salesgirl for the millinery department to place ten hats on these heads according to her taste. If a popular vote has already been taken on the placement of these hats, her value can be very quickly determined by her selection and the quickness with which she makes it. As we have tried to make plain before, no one quality may be the essential for a particular job, so that probable additional requisites for a millinery salesgirl might be tact, a good line of conversation, and a pleasing appearance, which characteristics we treat under other headings. Variations will no doubt suggest themselves to anybody handling any variety of artistic goods.

Although we have made no application of this to the book department of a store, we should certainly want to know if a prospective salesgirl was representative in her tastes of "The Duchess" type of literature or the Browning type, and we should assign her accordingly to the "popular shelves" or to the "high-brow stuff," as her companions would probably call it.

From our experience in some book departments, the salesgirls do not even seem to have ascended as high as "The Duchess" type, and if you ask them for a copy of Browning, they'll happily bring you a copy of "The Brownies."

It is said that it is a common experience with sales-managers to have a salesman "make good" in one territory and "fall down" in another. This is undoubtedly due to lack of consideration of his popular type. He may be representative of and in himself have the same tastes as the merchants in a coal-mining town. He can talk with them, for they are his own kind of people, but he is lost when he talks to the Boston merchant type. Dr. Blackford mentions a salesman who was figuratively kicked out of a Kansas office because he offered his prospective customer a drink of whiskey. This man was evidently not dealing with his type.

One of the oddities brought out by our study in the mental analysis of character is that a man's failings or vices may be among his commercial assets. It is doubtful whether a man whose record in mentality shows more than 90 per cent would make a successful salesman among the ordinary run of people. His attitude would be such that his arguments would go over their heads; or his customers might feel ill at ease; or, again, he would be so out of sympathy with ordinary people that he could not make the proper appeal. Politicians as a class might find a high average for intellect a positive detriment to themselves, though we must say it would be a great boon to humanity. The career of our law-makers is almost wholly dependent on their being of the same type of mind as the people they represent, and even our great statesmen have hypnotized themselves into adopting supposedly popular ideas as their

own, for they must adopt each new fad or go out of office. Consequently, there is much mental making-over in our legislative halls.

Business men should realize more fully even than they do the importance of this subject, and make public-opinion campaigns. Most of the popular fads before the public to-day were not thought out by the populace but propagated by magazines and newspapers to sell copy, and where people are not so influenced our tests show they are fairly sane *en masse*. Mr Hearst is probably the greatest former of public opinion in the country, and for this reason—in many respects he is the greatest political power in the United States. The three great parties have all felt it necessary to adopt most of the policies he advocates. If business men disagree with his ideas, it is not at all impossible that they could form public opinion themselves by using the same means. If a politician does not agree with public opinion, he has to have such a powerful mind and will power that he can reform it to suit himself. Mr. Bryan is such a type. He has been accused of excessive personal economy, but his greatest feat in this line is the small expense at which he can mould opinion. While it has probably cost Mr. Hearst millions of dollars to sway the public mind, Mr. Bryan accomplishes it by sheer force of personality. As long as he remains in his prime he can probably sway the Democratic conventions by his great, beating, dominant will, as he did when Mr. Wilson was nominated and we should not be at all surprised if his dynamic mind should achieve the astounding feat of eventually committing the Democratic party to prohibition.

We hope that we have made this point clear—that popular opinion is the easiest means of rating people,

and a vital commercial factor; and one must be in himself representative of the public mind, or be able, like Mr. Bryan, to sway it wherever it has to be dealt with. Thus anyone with goods of any kind to sell must, like the politician, either know public opinion or be able to control it, or he must hire someone who can deal with it or *be* it. It is not a vital factor for hand workers in making goods, but it is absolutely essential in designing and selling any article of commerce. It can all be reduced to known laws, statistics, and mathematics; and where the employer has to deal with it in any phase, he can pick his man to handle it, with very definite results.

Popular Theories

One may wonder, after taking statistics on the subject as we have done, why popular opinions in matters of belief are more subject to the elements of chance than to reason. This may be owing to the idea that truth lies in the outside world of facts rather than in our mental conception of those facts, and vagueness as to fact causes the vacillation of the public mind. Most of the absolute laws of the universe have yet to be discovered, and few of the things about which we conceive theories can yet be settled by arbitrary rules. It is a mistake for scientists and philosophers to propound theories as final solutions of any problem, for they are so only in the limited field of their thought or investigations. Lest the reader should misunderstand our attitude, let us go further into the subject; it is of direct application to our work, since this treatment will finally show a method of getting the best out of a force of workmen who have already been employed.

To define the terms of our subject, a *theory* is a possible explanation of facts, or a conclusion drawn from observations. A theory which can be mathematically proved is called a *law*. A theory which is true in a majority of cases may be called a *high average theory*. One incapable of even high average demonstration may be called a *tentative* theory.

Although observations are the best kind of memory records, it is essential at this point to call attention to the fact that the theories we evolve therefrom are not necessarily correct. In fact, the most of our theories are quite fallible. The author has to confess that many of the theories he has had in life have been wrong, quite wrong, and the query will at once occur to the reader whether, if he goes further into this subject with us, he may not, therefore, be led quite astray. We acknowledge that there is danger of this very occurrence, but that the safest course is to read on and confirm or reject our findings by tests of the reader's own. On the other hand, we feel that the reader is comparatively safe from the fact that we have already tested the most of our findings and proved them correct, while those as yet in the purely theoretic state are given as such. Our method in this is presented as illustrative of the only way to deal with theories. Try them out. Many people will form a theory on one observation and stick to it the rest of their lives. Enough observations should be taken to get an average of results, and the truth of the theory will usually stand or fall on such a series of tests. If the theory is modified by the laws of chance and possibility, a law based on averages will give a general idea of how often it will hold, and our charts given under the *law of averages* will fairly indicate the probability of our being right.

Theories are of three classes, as above: those which can be proved and become subject to unalterable mathematical law, those which can be proved to hold good only in a majority of cases, and those incapable of demonstration. Much vagueness of discussion would be dissolved if we could come to a clear comprehension of these points. As illustrative of theories reduced to unalterable mathematical law, we have in astronomy, that of gravitation; in chemistry and physics, that all elements can be reduced to a gas, liquid, and solid state; in physiology, that all mammals propagate by contact of the male with the female. As illustrative of theories that can be proved to stand in the majority of cases, we may give the following: that vaccination is a preventive of smallpox, that the white man is superior to the negro, that perseverance brings success. An example of an unprovable tentative theory at present would be the belief that all forces are phases of vibration.

The three *high average theories* above can be said to be right *usually;* and that is the best we can say, for many cases have been proved where vaccination did not prevent smallpox, where particular negroes were far superior to particular whites, and where perseverance resulted in failure. We expect too much of theories in life; for, as a matter of fact, most theories can never be proved as infallible—only as true of a certain average percentage of cases; and it is very easy to be wrong. The laws of chance often throw several successive instances under our observation which seem to reveal a law when it is only an average in a limited number of cases. The author has confessed his own weakness in this regard, but he is by no means so humble as to depreciate himself, for he has found their

deceptiveness and is constantly wary of the beautiful phantoms of thought, while some others will not come so frankly to the confessional.

Expressed mathematically, a theory is right or wrong according to the following formulae:

Infallible theory, 1,000,000 proofs out of 1,000,000 trials.
A high average theory, 50 plus X proofs out of 100 trials.
A wrong average theory, 50 minus X proofs out of 100 trials.

In labor standardization, as illustrative of the case, we claim few infallible theories. We consider we have a test of calculable value if it holds good 55 times out of 100. We are delighted if we can get one to prove up 70 times out of 100, and we abandon it if it falls below 50 times out of 100. If it falls far below, we pick it up again as of value as a negative factor. A single theory of 55 to 100 would be of little value in picking an employee for his job, but if mathematically weighted according to its value and combined with other tests, it achieves a place of importance.

In the business world we believe there are as few infallible theories as we find in our own branch, and it is lucky if it shows as good a record in *high average theories.* In fact, as nearly every railroad in the country has gone bankrupt at some time and as 90 per cent of business ventures are failures, we do not feel that we have to apologize. It seems to show that 90 per cent of business theories are failures. We can mention a few popular ones that are questionable: The theory that more work can always be achieved in a ten-hour day than in an eight-hour one has been disproved in a number of cases. The theory that day time is the only time to work has been abandoned by several of

our most successful American firms, who have adopted the three-shift idea as a permanent policy. The theory of grouping machines of the same kind together instead of in allied feeding systems for standard work is being abandoned by many progressive firms.

In social life it is probably safe to say that over 50 per cent of the laws passed could be proved even detrimental by submission to the *law of averages.* Even our most dearly beloved health and educational laws have been rushed into being on a largely theoretical basis. It is sad to think, but most of the theories of the world have been proved wrong. Most of the theories of Roman and Grecian times have been discarded, and the recent progress of science seems to be toppling over many of the favorite hypotheses of our present age.

As to the application of these thoughts to labor standardization: Theories are a part of the memory data in intelligent minds, and as such they need classification in summing up the employee's personality. The tests we have given therein are usually for interior standards, as distinct from the exterior standard tests given to the prospective employee. They naturally have to be adapted to the work of any particular company. As our tests were given with special application to a particular company, we have modified the questions below to make them more general. These questions may be inserted in the pay envelope to be answered at the leisure of the workman.

To Our Employees

The company wishes to do justice to every one employed by us, and some have no doubt felt that they had ideas which could be of profit in our work. This is a chance for you to

express and unburden yourself, and we will give everything you say careful consideration. While it may be impossible for us to make immediate use of your suggestions, anything of value will be given credit on your record and we hope some day it may prove of profit to you.

1. Do you have any trouble in securing the proper material or pieces for your work? If so, what can we do to better conditions?

2. Are there any improvements you can suggest in the machinery or process of doing your work?

3. Is there any means by which the company can help you to turn out a greater or better product?

4. Are there any suggestions whatever that you believe would help the prosperity of the company, in economy, saving of waste, new products, by-products, or anything that you may have in mind?

A set of questions such as the above will bring out the value of the theories of employees, and many employers after reading a number of answers will be convinced that most theories are wrong; but there is this significant fact—that the employer is likely to be wrong himself in many cases. Many valuable suggestions will be evolved that may prove of incalculable value, and the answers will form a basis for ratings on initiative, inventiveness, and intelligence.

Chapter XII

COMBINATION MENTAL AND PHYSICAL TRAITS—APPEARANCE; VOICE

Tests: Neatness, style, refinement, looks, facial lines, character-reading ability, and voice classification.

Application to executives, office force, sales force, models, public speakers, singers, and general. Character of a business organization judged by appearance of its representatives. Appearance and past success. The eye in business. Hair and its effect. Facial lines. Face control. Intuitions. Tension of eye, mouth, forehead, and cheek muscles. How different lines may effect the same face. Limitations of this method. The voice in its range, volume, refinement, vivacity, elocution, finality, and beauty.

THERE are some characteristics which are combinations of both mental and physical qualities. Appearance and voice both come under this head.

Appearance consists in the cast and color of features and body, which Nature gives us; the lines and developments thereof; and the condition in which we keep and clothe the whole. The cast and color are usually a physical heritage, and our mental make-up and environment determine the rest.

Appearance ratings receive their value from the fact that a firm is judged by the outside make-up or looks of its representatives. For this reason all high-class firms insist that the employees who represent them in

their sales or office staff shall present a good and neat appearance and at least *look* intelligent. Some firms, however, draw the line on extremes. A Chicago department store has instructed its employment department not to pass girls dressed in extreme styles. The United Cigar Stores does not care for flashily dressed salesmen.

Employment experts also take appearance into consideration in judging a man's past success and value by present looks. The Vocationalists who use the observational method claim that the color of the eyes and hair, and the shape of the features, indicate a man's character. We have not had much success in our attempts to read characteristics by this method, but have reserved a place on our index card for recording these matters for statistical data, so that in time we shall know definitely their relative importance.

The cartoonists depict sadness by turning down the corners of the mouth and joy by turning them up. One of the most successful employment experts of New York looks for these turned-up corners and will have no other kind of girls if he has any choice.

The matter of *neatness* in appearance can receive a mathematical rating by allowing (as shown on our index card) a rating of 4 points for condition of clothes and 1 point each for manicuring, cleanliness, linen, shoes, hair and teeth. A neat appearance may be prophetical of neat work, but not necessarily so.

Style, as shown in the index card, can be rated as *expensive, extreme, good, cheap, careless,* and *resourceful.*

Refinement can be recorded as *high, polished, respectable, and neutral.* Its importance is related mainly to salespeople.

Looks can be classified as *handsome, medium, plain, unique. Mobility* and the use of *cosmetics* are noted. *Looks* are a means of judging a girl's possibilities of early marriage, which is a negative element of her value with some firms, as they do not wish to waste money on training girls who will leave them soon. I have known one superintendent to choose the plainest girls possible to work at a machine with a man, so as to discourage love-making. Some employers will have none but handsome girls working for them, and beauty is an asset in waitresses, so that ratings on these points are by no means absurd but a commercial necessity. Other qualities may be noted in our chart and index card, with sub-classifications. They are usually judged by the observational method and a good character reader can make the proper records.

Eyes are classified for *color, size* and *steadiness* of gaze. Vocationalists claim that the color has a distinct value in showing the kind of work of which people are capable; but, with the use of tests, it is not necessary to rely on such estimates. Large eyes are among the commercial assets of actresses, especially for moving pictures. Steadiness of gaze is an advantage for the salesman, since it tends to make people believe a person is sincere; but, as a matter of fact, professional impostors develop this trait, so that we do not use it as a test for sincerity. Some people will not gaze steadily because of humility; others because it becomes impertinent; and still others, with especially piercing eyes, find that it embarrasses their companions.

Hair is rated as to *color, quantity, curl, size, length, falsity* and *dyeing. Length* is an asset of professional models. *Falsity* and *dyeing* are undoubtedly indicative

of character, the peroxide blonde being always looked upon with suspicion. Vocationalists place much dependence on the other qualities; but, if significant, they need be used only as confirmatory evidence for various traits in a test system.

Facial Characteristics

We believe there is a large field for psychologists and vocationalists in analysis of face control and lines. Much theoretical (but little scientific) work has been done in this line, and artists and actors are better authorities on the subject than scientists at present, so far as we know.

Facial control and lines will tell a large part of the story of mature people, but it is very difficult to lay down definite laws on the subject and what we have to say will probably be subject to many exceptions, so that the reader must not arbitrarily accept it as the ultimate truth. The labor standardizer should be able to read faces as a preliminary to test work, for it will save much time and money to be able by this method to weed out the very evidently unfit before applying further tests to the more acceptable.

First, as to face control: during waking hours the average person keeps the face constantly under certain muscular tensions which more or less reveal his character. When asleep these muscles relax, giving the inane expression which most of us have in that state. Very few of us could get jobs if we were sized up in our beds. These tensions in the face draw the mouth into certain fixed lines, hold the eyelids open at a definite width, draw the eye-brows more or less apart or together, and fix the cheek muscles in various positions.

Sustained emotions or thoughts eventually give these muscular tensions a permanent set in our waking hours and we relapse to the uncharted innocence of childhood only when we lose consciousness.

These muscular adjustments are so delicate that it is almost impossible to describe them, but people are so constantly subject to our observations that most of us, through many unconscious records on our memory, come to know their meaning. Especially is this so when the emotions eventually leave definite lines in the countenance. We call this ability to read character in the countenance *intuition,* but it is really the cumulative records of our experience in dealing with people. The shades of change in features we have observed all our lives, but the impressions were accumulated so gradually and vaguely that they became unconscious knowledge. Most of our memories are so definite that we can use words of quality or dimensions to describe them, but there are a large number of memory phenomena, such as the above, which never assume clear enough shape for such description, and a certain amount of superstition has entered into our conception thereof. Not knowing clearly just how we acquired them, we are likely to think they are inherited or inspired and we give them the name of *intuitions.* The name is good enough if only we separate it from any miraculous associations. With this idea of the term, we can acknowledge that intuitive reading of faces is a fairly safe guide, perhaps safer at present than scientific attempts at face analysis.

By actual test with a number of people we find that average intuitive ability to read character is 66 per cent. Possibly the safest method is first to judge a face by this faculty and to depend on that judgment, and

then to analyze it on the basis of racial characteristics, shape, and the lines of the features, as do the vocationalists, such as Blackford and Kibby, whose books are full of useful data. As we tried to impress on the reader in a former chapter, our observations are the most useful memory factors we have (much more dependable than authority or crowd instincts) if we have the courage to depend upon them, so that our intuitions as to facial characteristics are as yet our best means of judgment until science shall give us accurate methods. This is so merely as to facial analysis, since it is obvious that mental and physical tests are more conclusive even than this. For instance, we can form a fair intuitive knowledge from a man's face as to whether or not he can extract the cube root of 1,000, but the absolute, conclusive method is to test him and ask him to do it.

With this idea as to the limitations of the subject, we can proceed to some definite study. Much can be observed from the tensions around a person's mouth. In its natural state of babyhood, or that of a vacant-minded, beautiful woman, the mouth forms a perfectly relaxed Cupid's bow. Such a state indicates an absence of character—neither violent passions nor strong virtues. The owner might yield to temptations without much resistance, or might resist through physical or social fear. Indulgence, good humor, petulance, or will power will change the mouth lines. Indulgence changes not so much from tensions as from fatty or bloated deposits below or above the lips. Good humor, as is well known, lifts the outer corners, while petulance depresses them. Will power or "bossiness" tends to straighten out the bow of the mouth. The tensions of will power eventually set straight up-and-down

lines in the countenance, first at the corners of the mouth, and thence on outward to each side of the face.

As to the cheeks, good nature tends to keep them elevated, gloom to lower them. Executive ability, bossiness, or determination hold the lower portions in hard set lines.

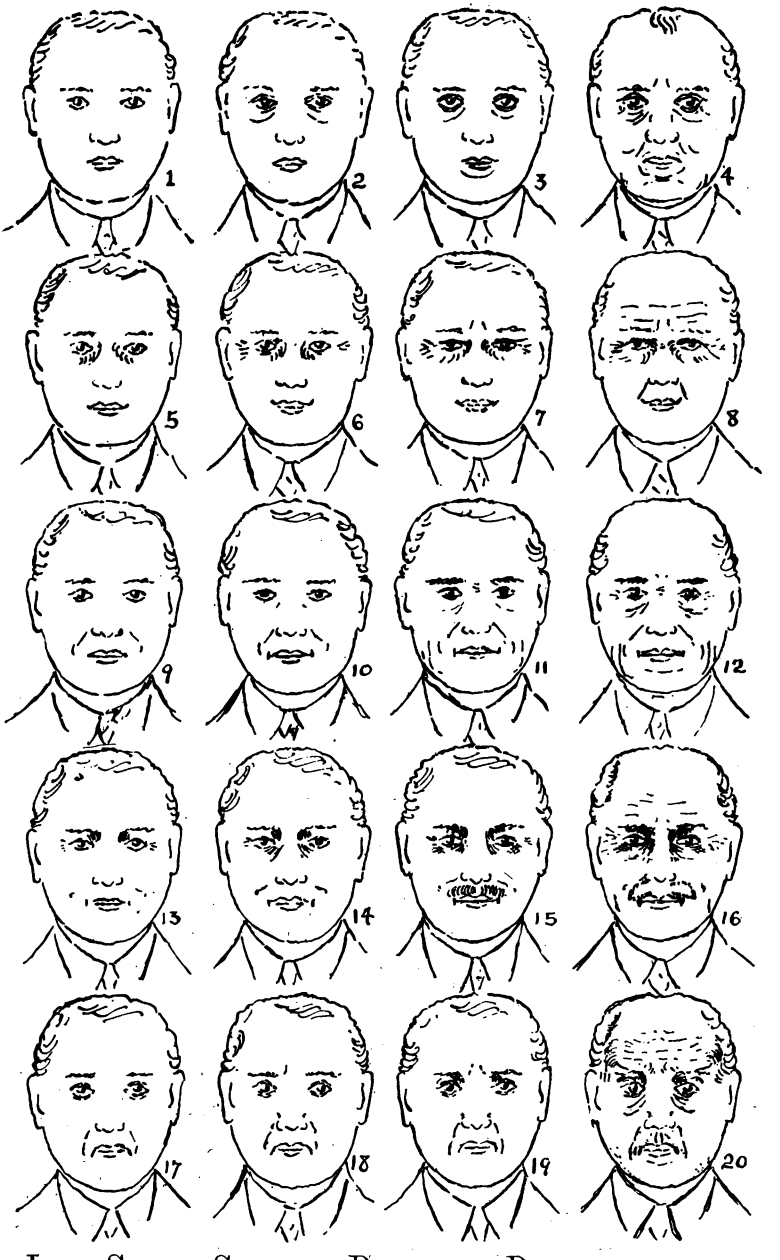
The eyes give expression to the thoughts. Wide-open eyes express surprise and fear, while if they are constantly held wide open it usually indicates vacuity, or "nobody home" in modern expressive slang. In our personal-opinion tests, people with *chaotic* minds, who cannot formulate their thoughts, often have these wide-open eyes. Half-closed eyes have had the reputation of showing a suspicious nature and indicating sinister thoughts. The villain in our dramas can no doubt register these emotions by such a method, but the face must usually have some other evil attributes to be a success in such expression. To our mind, half-closed eyes simply show thought. If the rest of the countenance should be evil, sinister thoughts will be expressed; but if the rest of the countenance is good, kindly thoughts or intelligence will be indicated. Practically all the lines around the eyes indicate intelligence, as the muscles in this region are in constant motion when we are memorizing or thinking. Possibly this is because most of our thoughts are connected with observations made by the eye, and in thinking we are constantly visualizing the objects of our thoughts.

The tensions in the forehead are mostly of worry, anger, and thought. A frown may be merely the effort to focus the eyes, or may be indicative of any of these three emotions. Tensions on each side of the frown may come from constant pain as well as from any of the causes just mentioned. Tensions and lines on one

side of the forehead are especially indicative of worry, as are the raising of the outer ends of the eyebrows.

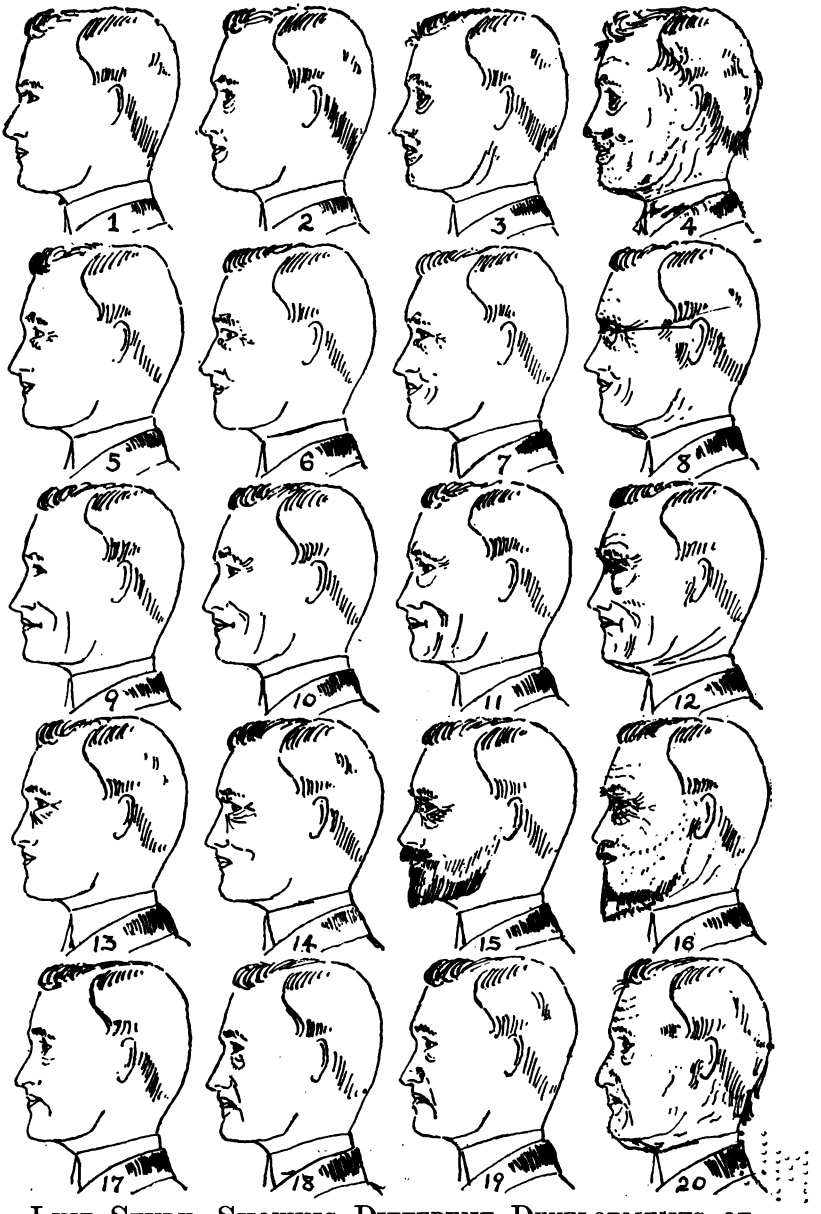
As already suggested, the constant or recurring tensions in the face cause creases which eventually become permanently set, and show the dominant emotions of a person's life. We have indicated in pages 172 and 173 how the blank countenance of youth may change in various states of life, showing five general tendencies in each figure, winding up with the result of the tendencies in the five faces shown on the right of each page. The basic face No. 1 has been traced as the foundation for all the faces, and if the reader will take the trouble and trace any lines on the other faces and put them in face No. 1, he will get the same countenance. In other words, every face on these pages is face No. 1 with character lines only inserted. Each horizontal row shows a separate development of a type of character. Before we shall say anything further let the reader look at the rows of faces to the extreme right of the pages and by intuition, if possible, decide what type of men they indicate and note their characteristics.

Face No. 1, page 172, is what the phrenologists and vocationalists would call the vital, well-nourished type of personality. Whether it holds to this type throughout the reader will have to judge for himself, but every face on page 172 has this same vital outline and features, although they may appear to change. The changes from 1 to 4 indicate the easiest development for this type, provided it has an easy time financially. The lines under the eyes and lips are not so much creases in the face as bloating and fattening of the features, indicating self-indulgence and sporting proclivities. While this man does not let himself go completely, he probably drinks more than is good for him.



LINE STUDY, SHOWING DIFFERENT DEVELOPMENTS OF THE SAME FACE

All these faces were made by drawing in lines on face No. 1 as a basis. After analyzing faces 4, 8, 12, 16, and 20, the reader will be interested in comparing his views with the Author's.



LINE STUDY, SHOWING DIFFERENT DEVELOPMENTS OF THE SAME FACE

All these faces were made by drawing in lines on face No. 1, which is the basis. These lines show how the same face may develop into five distinct types.

Faces 5 to 8 inclusive, page 172, show an entirely different development. The lines running almost perpendicular to the inner part of the eye indicate thought; the upturned lips show good nature. The lines running from the outer ends of the eyes in 6 show kindliness and a sense of humor. The gradual closing of the eyes in 7 shows increasing thought and in 8, with some age lines added, we have the elderly, kindly, thoughtful, banker type of individual. Faces 9 to 12, inclusive, show still another possible development of the same young man. In 9 responsibility and determination have straightened out his mouth and set his lower cheek-muscles tensely to each side of the mouth. In 10 the dents on each side of the lips show increased firmness. In 11 the jaw has developed the muscular control of a bull dog, and some thought lines come under the eyes. Face 12 shows the lengthening and ageing of these lines and some slight kindliness each side of the eyes, and we have the elderly, strong, executive type of man; not so thoughtful as face 8, but showing greater responsibility in dealing possibly with the lower types of men, where the former has dealt with the higher. Faces 13 to 16 show the same development of determination but not to such a dynamic extent, since the jowls do not become so strongly developed. This man has control of men, but more mentality as the thought lines and deepening of his eyes indicate. He has planning ability, besides executive force. Such men, when they reach the stage where they control their own fortunes, often grow a mustache, while the pure executive type can hardly ever abide whiskers, and the subservient type fear to wear them either because youth in this age commands higher wages or the crowd instinct controls. Face No. 17 be-

gins early to droop around the mouth from pessimism or a bad temper. The little indentation above the nostrils in faces 18 and 19 show cynicism and sneering tendencies and the frown ill-humor. These all increase and age in 20. The lifting of the outer eyebrows and the creased forehead in this case show worry, and the lines under the eyes and mouth show indulgence rather than thought. The eyes remain wide open, showing that this man is not a deep thinker. He develops into an irascible, pessimistic, self-indulgent, general nuisance.

Face 1, page 173, is the undeveloped, angular, pure American type. Face 2 shows bloating, self-indulgence lines under the eyes and lips. Face 3 shows increase in these lines and slight fattening of the lower nose, with a loss of self-control indicated by slightly unkempt hair and the need of a shave. Face 4 shows utter loss of any restraining influences and full devotion to impulses. The lips, nose, and eyes have swelled. The lines in the face are aimless, uncontrolled and fatty, and the hair unkempt. The man has become a tramp or drunkard. Faces 5 to 8 show how this man goes through the corresponding development of face 8, page 172, only in this case the man becomes a kindly old professor. The differences were attained by a slighter depression of the eyes which comes with age, by greater use of the eyes, as indicated by the glasses, and by the lines of control about the mouth developed by keeping the boys in order. Faces 9 to 12 show the same executive development in this type of man, as indicated by the corresponding faces on page 172, the only difference being a more pronounced bay-window under the eyes, which often is noticed in executives. Faces 13 to 16 show the development of this type into

the professional type—doctors, engineers, architects, etc. The whole effect is achieved by the thought lines of the eye, and by the whiskers which this type of man often cultivates, since the age effect thereof is usually no detriment to his calling and his natural instinct seems to run that way. Faces 17 to 19 show the effect of pessimism and cynicism on this type of man. The linings are much the same as the corresponding numbers in the former figure. Since this type of man is not so well nourished as the other type, the same lines show greater age effects, seeming to indicate a quicker decay. No. 4 has let his senses run loose, while No. 20 has let his emotions run riot, both showing different kinds of human wrecks.

The foregoing discussion of facial lines is all as true as your observation may confirm it, but the trouble is that as soon as we have nicely laid down a set of rules for the linings in the face we will see these lines in a face where our intuitions tell us that the rules as set forth here are untrue. This brings us back to our discussion of theories formerly treated. We can only say our findings are true, as a high average theory, in 50 *plus* cases out of 100. Just what the average of truth may be we hope some scientist will arise some day and tell us. As a matter of interest, the author tested himself by having a friend submit to him faces of ten people unknown to him. The friend had already marked each face for ten points of character. I separately marked for the same points, and achieved an average of 76 per cent correctness. On comparing notes the friend acknowledged a number of uncertainties in himself in both character points and definitions, and agreed that I was possibly 91 per cent correct; but it is just to say that the rules set forth above were only a par-

tial basis, and that intuitions were quite a vital factor, so that 76 per cent would probably be close to the *highest average correctness* of these theories.

This discussion is important, since many place absolute dependence on the ability to analyze character by the appearance. We believe such ability should be intuitive with, or acquired by, the labor standardizer; but it has its limitations. The first limitation is fallibility. The man with the highest power we have ever tested in this regard had a fallibility of 20.8 per cent, making the maximum average of 79.2 per cent (after also making a calculation for the fallibility of the committee that tested him). The second limitation consists in the range of facial tests; since, after all, only a few of the human characteristics can be read in the face, and those only positively or negatively—not quantitatively. By this we mean that while we may be able, by looking into a man's face, to tell positively or negatively whether he has the intelligence to be a mathematician, we cannot thus tell *how* good a mathematician he is; only a test of some problems will reveal his exact relative ability in rating with other men of his kind. We may tell by looking at a man if he has mechanical ability or not, but only a test, either by cross-examination or on a machine, will rank him in ability as compared to other machinists. If he knows the depth, speed, and angle of cut or tool to shape a certain machine part, we have some definite data by which to rate him. The third limitation consists, as Mr. Harrington Emerson says, in the characteristics of the job. We may be able by wonderful intuitions and training to size up the man, but this gives us few data as to whether he may be fitted for a certain job. This latter has to be analyzed by the *law of extremes,* as formerly

CHARACTER READING

These photographs show front and side views of the faces of five people. The subject marks down his opinion of the characteristics of these people in the chart following. By the use of this test it has been found that average ability in analysis from untouched photographs is 66 per cent and maximum ability 79.2 per cent.

outlined, or by a man of wonderful analytical power who knows the job.

We are now concerned with the capacity of an employee and not with our ability to read him; but as this latter naturally comes up at this point, we will treat it here. The ability of a person to read character from facial shape and delineations can be very closely estimated. On page 178, opposite, are shown the front and side faces of five people. In the diagram just below will be found ten characteristics, each possessed by one or more of these people, with entry blanks opposite the numbers corresponding to each individual. In the actual test photographs of ten people are used. The subject being tested for ability to read character looks at the faces and fills in these blanks according to the following directions taken from our tests of the Emerson Company:

Kindly look at the photographs herewith. They are numbered from 1 to 10, those having the same number being the front and side views of the same person. Mark in the spaces what you believe are the characteristics of these people. Read the characteristics to the left and then write yes or no under the proper number in answer, or put a question mark (?) to indicate medium.

	1	2	3	4	5	6	7	8	9	10
Quick in action										
Artistic										
Self-confident										
Highly educated										
Constant church-goer										
Very saving										
Irritable										
Healthy										
Very temperate in drink										
Industrious										

It will be seen there are 100 points for rating. A committee of three people, including the author, who knew all these persons well, have marked these characteristics. Without consultation they separately agreed on 80.3 per cent. Then they got together and agreed on the remainder. Still there is a possibility of 10 per cent fallibility in this committee, which should cover also disagreement in definitions. We have found average ability on sixty-two trials of this test to be 60 per cent, to which we may add 10 per cent for the fallibility of the committee, giving average character-reading ability as 66 per cent. The highest record of these sixty-two trials was 79.2 as formerly stated. The general average may be a trifle higher than general human average since a number of those tested had made special study in character analysis.

At the bottom of the index card in our chapter on personality, will be found composite faces with character linings dotted therein. The employment manager can take a record of facial shapes and linings by filling in heavy lines over the dots which most nearly conform to the employee of record. These form a good basis for future statistics, if not for conclusive present data.

Voice

Voice is, of necessity, a physical attribute; but, like appearance, it is largely influenced by mental state and environment. A good voice is of commercial value to actors, singers, public speakers, and salesmen, and *to some extent, to executives.* Finality of tone will make a workman or a child obey an order. Sincerity of expression will make a buyer close a contract. Sharpness

and raspiness will keep a force in constant irritation. Beauty of vocal expression will cause audiences to succumb to emotion.

The voice is classified as to *range, volume, refinement, vivacity, elocution, finality,* and *beauty.* The range is subject to exact rating by testing on a piano and marking range from low E to high C. Volume is subject to exact rating by vibrating diaphragms, but we have made no tests thereof. Refinement, vivacity, elocution and finality are matters of personal estimate. Beauty is largely a matter of tone color and of pronunciation of the vowels and elision of consonants; these can be modulated to great delicacy by professional teachers, the flat *a* being the extreme of unpleasantness and the Italian *ah* being the extreme of beauty. It may be subject to exact rating, but at present is still a matter of personal estimate.

Chapter XIII

PHYSICAL MAKE-UP

Health, Vitality, Sense Perception, Measures, Shape, Color

Tests: Poor circulation, lung capacity, and vital index; teeth, color, perception, range of sight; co-ordination of hand, eye, and ear; hearing, deafness, trueness, perception, range; smelling, tasting, feeling.

Application to laborers, mechanics, railroad men, dyers, designers, salesmen, telephone girls, and machine operators.

Employers who are making physical tests. Lunches as part of wage. Body measures. Stout and thin people. Average height. Tall and short people.

THE TREATMENT of standardization so far has considered the determination of qualities or aptitudes which are important principally in executives, office assistants and the sales force. The examination of the physical make-up is directly applicable to the large mass of workers.

Examinations as to health and vitality are usually made by physicians, and every up-to-date employment department should have a medical adviser for this purpose. If one can be found with business insight, he can be trained to give the mental as well as the physical tests, where the firm is so small as not to warrant the expense of several employment specialists.

Physical tests can be made very quickly. The Interborough Rapid Transit Company, the Baltimore & Ohio Railroad Company, and the United Cigar Stores Company put a subject through an inspection in about eight minutes, but the points covered are not as full as necessary for a complete system of standardization.

Employers who are already making physical tests have undertaken them largely because of the labor laws. Their main object is to find any physical weakness or strain that might be alleged in the future as a ground for indemnity, or which might render the subject liable to added injury in their employ. To this they usually add a few theories as to fitness for the job; but, so far as we know, without actual test by the *law of extremes.* In this latter we believe the labor organizers have some cause for dissatisfaction; for in our tests so far, a single physical defect rarely has more than a 5 per cent adverse weight out of 100 points, and may easily be atoned for by experience, ambition or other mental and physical qualities. Care must be taken in all investigations to do the workman absolute justice, and the effort should be to unearth hidden treasure and make the man valuable rather than to consign him to the discard. Investigations conducted by intelligent tests as to fitness, instead of by theories, will eventually do the workman much more good than injury.

Custom has established certain specific forms of physical tests, most of which, however, are not taken for ordinary workmen unless a particular job demands it.

The *heart* and *blood* should be tested for rhythm, size, blood pressure and circulation. Indications of

poor circulation are cold hands and feet which show low vitality.

The *lungs* are tested for capacity and condition. The Metropolitan Life Company investigates the health of its employees, and if tuberculosis is found they are sent to a sanitorium conducted by the company. So many charitable institutions have been established for the treatment of tubercular patients that a workman can usually be sent for free treatment to the headquarters of one of these organizations. For lung capacity there are two kinds of instruments called spirometers; one working on the principle of actual air displacement and the other on the principle of the gas meter. Both are blown into through a mouth piece and rubber tube. The readings are usually in cubic inches. A ratio between the weight and lung capacity gives the *vital index*. This shows the number of breath units per unit of weight, and expresses the capacity for revivifying the blood during fatigue. Our *vital index* is taken by dividing the number of cubic-centimeters capacity by the weight in kilograms, with the following results:

American men, 67 cubic centimeters per kilogram of weight.

Slavic workmen, 63 cubic centimeters per kilogram of weight.

American women, 60 cubic centimeters per kilogram of weight.

Foreign women, 52 cubic centimeters per kilogram of weight.

Of the figures above, that for the American men will be found trustworthy. As to the rest, the American women were not quite typical and the foreign subjects probably did not do their best owing to the difficulty of interpretation. The lung capacity is of little import-

ance unless compared to weight. The ratio of the vital index found above is of importance wherever the work is heavy enough to cause fatigue, but in most trials by the *law of extremes* it has not been found of any significance.

THE SPIROMETER FOR TESTING LUNG CAPACITY

Courtesy of the Kny-Scheerer Corporation.

Spirometers are built on the meter principle like a gas meter, as shown, or on actual displacement of a liquid. Lung capacity will vary from 140 to 400 cubic inches. A subject is allowed several trials, each with one filling of the lungs, and the highest record is taken. The record is not always entirely reliable as there is great variance with practice. The U. S. Naval Academy requires 256 cubic inches standard for a man of average height. We have found foreign laborers to average 303, foreign women 192.5, and American women in small classes 181.5. A dependable standard for human average will not be found until standard apparatus and methods are used. The record is of little use unless compared to the weight, which ratio is called the vital index. This shows the power of the lungs to revivify the blood in fatiguing operations, and is useful wherever fatigue is an element of the job.

As to *organic troubles, influence of past diseases, sprains* and *broken bones,* a physician must be the main authority; we are not now prepared to give any data.

Many companies are giving attention to the care of their employees' *feet*. If the occupation is one in which the subject has to do much standing, flat-footed persons are rejected. If the applicant has corns or bunions, he is not necessarily rejected but is treated for his trouble and has the privilege of free treatment by the company chiropodist whenever they cause future inconvenience.

Teeth are numbered thus:

8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1
1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8

Many firms employ dentists to inspect the teeth of each applicant for employment, and any tooth missing or needing treatment is checked off on the applicant's record, using the key list above. If the subject is employed, his teeth are put in first-class condition at cost, and the company dentist is always at the service of the employee. The condition of the teeth is considered important from the fact that they breed disease, or an employee is liable to suffer and thus neglect his work because of defective teeth, and very often will not have them fixed because of the cost.

Nutrition is a matter of extreme importance. We know of no one making careful tests on the subject; but after the employee is put to work, the standard is raised by a few companies who give their employees hearty lunches as part of their remuneration. The Metropolitan Life Insurance Company has been having notable success with this system, but it was introduced at the same time with other improvements so that they have been unable to separate it in their statistics to find its beneficial result. The idea of the employers

who are undertaking this is not philanthropy, since it is considered as part of the wage which the firm desires to expend itself, in order to be certain of well-nourished employees. Frankly speaking, it is often impossible, from family or other conditions, for some people to get enough to eat to do good work. Girls will spend money on hats or clothes instead of on necessary food, and it is not so infrequent as some think for an economical man to prefer saving to eating. In our opinion it would be a wise thing for more employers to see that at least a portion of the wages they pay is used to supply the proper fuel for work.

The Senses

Seeing, Hearing, Smelling, Tasting, Feeling

Dropping optical nomenclature as much as possible, *sight* is classified as to *color, perception, range, far sight, near sight, astigmatism, disease,* and *co-ordination.* If faults are corrected by glasses the subject is not rated as defective, note simply being made that glasses are worn.

Color perception is essential for railroad employees; dyers; designers; art, silk and ribbon salesmen, and for numerous other vocations. To save time, we have tried to get color tests by class work, exposing a chart on the wall, but it is surprising how definitions vary, even of the simplest color. This is no doubt due to the fact that the child is told a certain shade of color is "red" or "yellow," and red or yellow that color remains to the end of life no matter what charts may call it. We have had the most astonishing names given to tints by people who in after examination proved perfectly sound in color sight, so that their trouble was simply

one of definition. For this reason the railroad method of testing color by matching variously tinted yarns is the best means for classification. Under this head at the same time we make note of color terminology where such trade knowledge is necessary.

Range of vision is the name we give for a quick class test. A chart is exposed on the wall with ten figures ranging from 10 centimeters high to 3 millimeters in height. If the match-board is used, the subjects can set the sticks in the corresponding numbered holes. Without the match-board the subjects can set the numbers down on paper. In both cases the number of numbers read correctly forms a numerical rating of eye range. This is sufficient to find if there is any material defect in sight. If there should be, a more thorough examination is made. Care should be taken in this test that the figures always have the same amount of light. Otherwise, they will form no basis for ratings. To secure this condition, the figures should have a flood of three shaded electric lights thereon, always at the same distance and in close proximity. Every desk position in the room will naturally have to be separately standardized to get correct ratings.

We have attempted no work in *far* and *near sight, astigmatism,* or *diseased eyes.* If the range should be found very abnormal in the foregoing test, denoting one of these latter troubles, the subject would be advised to see an optician before applying for work again.

Hand and Eye Co-ordination

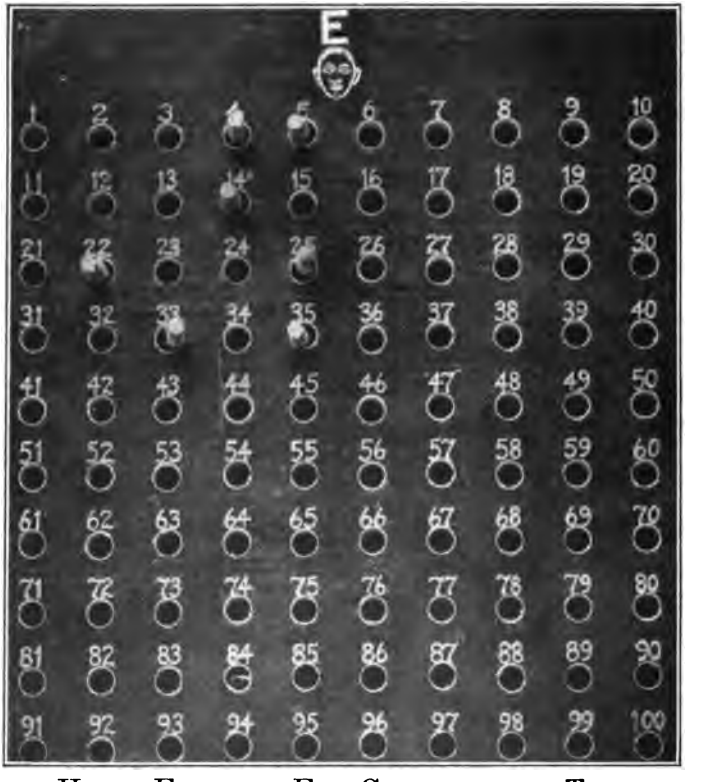
The quickness of the response of the hand to impulses arising from what the eye sees is called eye

and hand co-ordination. Very elaborate apparatus has been evolved for measuring this quality, consisting of an electric-key device which is pressed by the one tested when the eye gets a certain order. This pressure stops the hands of a clock which were started when the impulse originated, the dial recording the time elapsed between giving the order to the eye and the stopping of the clock by the hand. As the hands of the clock move with great speed, the time can be measured to the thousandth part of a second.

This trait is important to telephone-board operators, and in all kinds of work where quick hand-action is required in response to what the eye sees. It is essential in the instant stopping of a machine which will spoil valuable material when something goes wrong, or in the breaking of a thread on a loom, or in a machine that feeds small articles to the hand rapidly, each of which has to be taken care of. In fact, its application is wide.

Intricate apparatus of any kind is confusing to a subject who is under test, so that to measure this kind of co-ordination we have originated a simple test on the match-board described in the introductory chapter. There is a group of numbered holes; every two seconds we expose to view a large numeral. The subject is to find the correspondingly numbered hole on the board and stick a match therein. To get the best results this test should be repeated several times. The number of matches placed will give a numerical rating of the speed of eye-and-hand co-ordination. Very few can get more than five out of ten, but some will go as high as eight, showing wonderfully quick response; and it can be easily seen how these would excel in difficult operations requiring great eye-and-hand speed. This

test is rarely given unless an analysis of the occupation shows it to be essential.



HAND, EYE, AND EAR CO-ORDINATION TEST

This test is useful for telephone and machine operators, showing the speed of response of the hand to eye and ear signals. Each subject has a match-board. In the eye test, a large number is exposed at a certain distance every two seconds and the subject must find the corresponding numbered hole above, and put a match stick therein. The test is the same for ear signals, except that the numbers are called off. If ten numbers are used, the number of match sticks found in the right holes will give the standing. This set of holes can also be used as a test for range of eyesight by exposing ten numbers of graduated size at a fixed distance.

Hearing

A workman with a discerning ear can tell by the sound how his machine is going. Some printing foremen can sit in their offices and tell the instant anything happens on any press in the room. One such man told us how he heard an unusual sound from his corner press. None of the workmen had noticed anything out of the way. He rushed to the press and found one of his men tangled in the machinery, and if he had been an instant later the workman might have lost his life. We were riding in an auto when a discussion arose between the chauffeur and the owner as to what a certain unusual vibration indicated. They could not decide. The auto was taken into a garage and jacked up and run on the jacks. Several "experts" expressed opinions, and at last the highest authority was called in. He located the trouble by the keenness of his sound perception.

Hearing is classified as to *deafness, trueness, perception, range,* and *co-ordination.*

The degree of *deafness* is difficult to standardize. It can be told approximately by the response to the sound of the human voice, and since every voice is different, every examiner usually sets his own standards. In the normal ear a high whisper should be heard at arm's length. We tried means of standardizing by the tick of a watch, but every watch is different and every part of a room gives varying records owing to the reflection of sounds from surfaces.

Trueness is the exact perception of tone. It is tested by the subject repeating the tones of a piano, a tuning fork, or the human voice. It is essential to the pro-

fessional singer or musician, but otherwise has little relation to business.

Perception is the ability to recognize and classify sounds. A person may have a *true* ear and normal hearing, and yet little perception, which is the memory element of sound. It is the faculty by which the printing foreman and the garage expert recognized that something was wrong in the machinery they heard. It is the unconscious recording of past ear impressions by which we recognize present phenomena, and has the same relation to the ear that intuition has to sight. We know of no tests to rate it, but it is sufficiently important for careful study.

Range is the number of musical octaves which the ear can perceive. The lowest musical sound, 32 vibrations per second, can be heard by all with normal hearing, but the upper end of the range varies with different people, especially as age advances, and may run as high as 55,000 vibrations, it is claimed. We have made no tests for this since we have found no application in ordinary business.

Ear-and-hand co-ordination consists in the quickness of the response of the hand to ear impulses. It is related to business where any workman has to respond to orders received by the ear, not only from the voice but from the work, as a motorman or engineer to his bell or whistle, a stenographer in dictation, an elevator boy to the floor called, a telephone girl to her call; and in many machines where a click will be the signal to pull a lever or feed a unit. The tests are the same as for *eye-and-hand co-ordination;* only, if the clock is used, an ear signal is the notice to press the key, and in the match-board a number is *called* every two seconds instead of *shown.*

Smelling, Tasting and Feeling

Smelling has a limited application in business. The chemist often recognizes the presence of some compound by smell; the coffee tester, the perfumery expert, and the cigar maker have use of the faculty; and the miner may scent danger by keenness of this perception. So far as known, it is an open field for standardization.

Taste is in very much the same class as smelling, being a sister sense thereto. It has possibly a wider application in the culinary field and those who serve it.

Feeling is an important sense and has a distinct commercial value. While its logical place of treatment is here, we have grouped the main study of the hand all under one heading and will take it up when we reach that subject.

Measures, Shape and Color

As yet the *measures* of the human body have not been applied to any great extent to labor standardization. They have a direct application in professional models; and the height in ratio with the weight shows the relative stoutness or solidity. This latter has been proved of significance by the insurance societies in computing length of life, and it should, therefore, have a bearing on the vitality of the subject under test.

According to U. S. Army tables the normal ratio of inches to pounds of weight is as 1 to 2 from 64 to 67 inches high, inclusive; and from there runs up to a ratio of 1 to 2.4 for 73 inches. The chest measure, at expiration, for these heights ranges from 32 inches at 64 inches height, to 35¼ inches at 73 inches height.

The expanded chest should vary from 2 inches to 3 inches larger between these extremes. Since the spirometer reading shows approximately the actual volume of breath inhaled, we have not used the chest measures in our work.

As to relative stoutness, found by measurement, we have not found that the general impression of the slowness of stout people is correct. In fact, stout people have made some of our best speed records, for which we believe their finely nourished condition is responsible. One of the world's former speed records in typing was made by a comparatively stout girl, and a thin girl holds one of the present records. While thin people have the advantage of not overcoming the heavy inertia of stout people in speed movements, the stout ones gain, on the other hand, an advantage in vitality.

Outside of actual vitality conditions, stout people labor under a disadvantage with some employment experts, who hire inside salespeople. They will not give them a chance because of the room they occupy behind a counter. This is probably a necessary condition of small space but good salesmen may be lost thereby.

The vocationalists who use the observational method of analysis claim that very distinct characteristics go with thin and stout people. No doubt this is so, but since we find actual characteristics usually by test we do not rely on observations, though they may be valuable as confirmatory evidence.

The average *height* of men at 21 years is 172 centimeters (5 feet 7½ inches), or 5 feet 8 inches if taken in shoes. The average height of women is 160 centimeters in shoes, or 5 feet 3 inches, and women rarely go much above or below the general average.

Tall men are naturally best in any job where a long reach is necessary, and are at a disadvantage where there is much stooping. Theoretically, they are slower in movement; but we have not found that this counts for much in actual practice, except in small operations, and even here the detriment is rarely more than a 5 per cent factor in 100 points. Very small people are usually quick in movement, and they have to be in order to cover the ground of the average person. We have all noticed the quick, lightning, jerky movements of monkeys and midgets. The difference in work may be illustrated in packing operations. Where articles the size of a tomato can have to be moved from a 5-foot height and packed on a table 2 feet high—a total movement of 3 feet—the tall man should have the advantage. Where an article like an ink bottle has to be taken from a pile 1 foot distant and packed in a small case, the little person should have the advantage; but these points, weighed against vitality and ambition, prove a very small factor although real enough in close calculation.

One of our great editors pointed out that, mentally, small men are better, instancing Napoleon and Harriman; but what about Washington, Lincoln, William the Conqueror and the Grand Duke Nicholas?

With regard to other body measurements, we have no data that are dependable. As to *head* measures, *shape* of face, *color* of skin and hair, the vocationalists of the observational school claim these are all of great importance. We are taking statistics of these points, but have found nothing as yet upon which we can base dependence. They may, in time, prove of value as confirmatory evidence.

Chapter XIV

ACTION

Strength, Speed, Control—Arm, Hand, Fingers, General Action

Tests: Arm strength and endurance, arm speed, finger speed, right and left hands, ambidexterity, grip. Hand measures, heaviness of frame, relative size.

Application to laborers, piece-workers, piano polishers, weavers, watch-makers, typists, pianists, elocutionists, saleswomen, and models.

Advantages of class work. Records of Columbia students. Capacity as against possible record. The cost of the human hand. Trade theories as to the hand. Small fingers theoretically quicker. The nervous factor. Thickness, slenderness, and span of hand. Greater field for ambidexterity. Action, control, continuity, carefulness, rhythm, natural and dramatic.

WHEN it comes to purely physical characteristics, the difficulties of classifying individuals on a mathematical basis are very small. However, once they are rated, the application to various vocations is another and more evasive problem, but one nearing an exact solution.

It is our method to make as few personal examinations as possible, reducing the work to a class system. By this means we can take the records of from five to

fifty applicants or employees at once. Many of our arm, hand, finger, sight and hearing tests can be handled by these means, but body measurements are great time-consumers and we make very few, unless the peculiarity of the vocation demands it.

For all jobs requiring physical work, the action of the arm, hand, and fingers are of necessity the most important characteristics which we have to examine. Other traits are of importance according to their effect on the work of these members.

The Arm

As the study of this science progresses there will undoubtedly arise specialists who will devote their lives to the study of but one subject, and such a life work might well be devoted to a minute investigation of arm, hand, and finger action as affected by various vocations, and as they in turn affect the efficiency of the job. Since we have separated the subject into three parts, we will discuss here simply arm action as distinct from hand and finger action.

Foremen who select laborers usually look for big, strong, and husky men, and rightly so; but even so low a class as this can be better selected by scientific methods, for appearances may be deceptive. When you ask a man to lift his limit in pounds or kilograms on a dynamometer there is no "bluffing out" as to his ability in this line. In very heavy work four men carefully selected by the right methods can do the work of six ordinary laborers, thus making a material saving, since very strong laborers usually get only the same pay as ordinary men. These same heavy workers might not be able to do half the work of the other men

when set on a job handling light weights swiftly, hence careful analysis is essential even in the lowest class of workers.

In our tests so far we have not been able to get reliable data showing the relative work of very strong and medium strong men on various jobs, since the records of the companies were not so kept that we could carry out a comparison of the tests with the work; nor could the foremen furnish any reliable information, so that the best we have been able to do is simply to make examinations and get averages on men in laboring jobs.

It is essential that not only the strength of arm be found but also the endurance; our tests have been arranged to get a combination average on strength and endurance rather than on but one of these elements.

The principal test we have used in this line is to require the subject to lift a 12-pound weight vertically from the shoulder upward as many times as possible, until so fatigued as to necessitate stopping. Among foreign laborers the number of lifts ranged from 26 to 67. The time of fatigue ranged from 16 to 125 seconds. The total lift (computed by multiplying the number of lifts by 12 pounds) ranged from 312 pounds to 804 pounds. The total lift per second ranged from 5 pounds to 19.5 pounds.

These figures are very significant. The man who lifted 19.5 pounds per second made the smallest total lift of 312 pounds. He was very quick and worked himself to a finish almost at once. This man has, no doubt, his place in some line of work, but not as a heavy laborer. The next lowest record was a total lift of 372 pounds, but this man took his time at it and was below average in his lift per second. This man we would not

employ as a laborer unless he had some other very good qualities, but yet he had found his way into an organization which had a good labor market to draw upon. One man who made next to the highest lift also classed among the highest in lift per second. If this man had steady habits he would make an ideal worker.

When method of work, speed, and endurance show such a wide range as this simple test reveals, it seems sufficient proof that standardizing can be done even with the lowest grade of workers. In fact, few tests show such wide ranges as these, seeming to indicate that the lower the grade the greater is the necessity of a try-out.

Another test we have used to reveal arm endurance is to require the subject to hold an 8-pound weight extended at arm's length in front of him as long as possible. This test is not one of sheer strength, but one largely of grit and determination also. It revealed the fact that the man who made the best speed record in the former test was next to the weakest of those tested, or else he lacked will power. It confirmed the record of the best laborer in the former test, since he made the second record in this also. It further confirmed our opinion of the worst man in the former records, since he made one of the lowest records here.

We have used this latter test for women, substituting a 5-pound weight for the 8 pounds. We have not yet found a job where the work was sufficiently heavy to give this test for women any significance, since the best and the worst workers came to about the same average. These tests can be put through in class work.

We have taken no extreme strength tests and we do not know of any business concern that has taken such

records. The United States Civil Service requires the porters in the custom houses to be able to swing a 125-pound weight onto the shoulder. This is quite a light requirement. Dr. Geo. T. Meylan, of Columbia University, finds that the average strength of 249 students, averaging 21 years and 5 months old, is 51.9 kilograms for the right forearm, 47.2 kilograms for the left forearm.

Before closing the subject of arm strength, it is well to consider the further possibilities of tests in this line. There can be no doubt that the efficiency of any man requiring strength in his work is largely determined by his strength, speed, and endurance limits, so why not have sure and definite knowledge on the subject? Tests may be carried much further than we have carried them, and actual measurements made of the muscles required on particular work, with mathematical calculations made of what muscles of certain size with certain hardness can do. Hardness will be tested by a weight or resistance scale. This is a refinement which we can scarcely heed in our present-day methods, but the future will no doubt bring such results, and it will be interesting to calculate the factor of a man's capacity against his actual record in the tests; for if his measurements show a great capacity which his tests do not get, it will indicate deficiency in some one or more of the three qualities of will power, ambition, or persistence. It is an example of the fine points to which these tests can be carried and the extreme delicacy which can be acquired in estimating the limit of human capacity.

As to arm speed we have used a test on the matchboard formerly described. It requires no strength, being an operation of pure speed in which an element

of finger dexterity also enters. The subject is required to take a single match-stick from a box and convey it to a row of holes on an average of 38 centimeters distant. This operation is repeated as many times as possible in 30 seconds. The total path of the arm for each match, going and coming, is about 90 centimeters. The number of matches placed in the holes shows the number of movements made, like all match-board tests; and it is about the simplest method possible of getting records, being easily explained, quickly accomplished, and reduced to class instead of individual examinations. The test is repeated in a set of holes averaging about 50 centimeters distant. The average of this test is 14 for a long swing and 15 for a shorter one. The test comes after practice in similar tests, and is a good one for light piece-work.

This test has been proved of considerable importance by our system of testing the tests. In the piece-work operations, requiring an arm swing, which we have examined, the best workers averaged higher in this test than the poor workers, according to their actual piece records; and the arm swing, in combination with eight other tests, formed the basis by which our examinations arranged the workers in almost the same approximate order as an examination of their piece records showed—indicat-

ARM-SPEED TEST

The subject is asked to take headless match sticks, one at a time, and fill as many holes as possible in 30 seconds in the row of holes shown herewith.

ing that in actual practice tests of this nature can foretell almost with absolute accuracy what a hand worker can do.

As a basis for employment, such a combination record as this shows not only the difference between a good worker and a bad worker, but it goes further and determines, with approximate surety, the relative position in which the good will stand with reference to each other provided they are given a proper incentive and the same chance.

Hands and Fingers

Nearly everything of money value in this world gets its worth from the human touch. The Midas hand of humanity turns whatever it fingers into its representative weight in gold. Diamonds gain their high value not only from rarity but because tons of the earth's soil have to be handled to find one little stone. Gold itself gets its worth not merely from scarcity but from the immense work in accummulating one ounce. The house we live in is composed of nearly worthless minerals and vegetable matter, made costly only by the many hands that have touched each piece on its way from the ground to the complete building, every fleeting touch adding to the weight of gold which it takes to represent its value. As the tree stands in the forest it is worth little to the owner, its first great cost coming when the hand touches the axe to hew it down; a few cents more are added when the loader has to touch it to get it on his team, the next when the laborer lends his fleeting touch to place it on the log pile by the mill, then a few cents to the sawyer who cuts it, a few more to the planer who dresses it, a few more to the sorter,

then again the teamster, the freight handler, the laborers who built the railroad that it might be hauled, again more laborers to the local lumber yard, there the piler, then the teamster, and, finally, the carpenter. Probably a hundred hands have touched it on its way from the forest till it finally lies in the floor beneath our feet. In the forest it was worth possibly one-tenth of a cent a foot to the owner. The human touch has made it worth 100 times as much as it rests in its final place. It is to avoid the human touch that machinery and cranes are built. The great task of economists in modern life is to solve this problem of the human touch. It is the one great factor of socialism. It is the greatest factor in the physical branch of labor standardization and business.

This is still a material world, and work must still be done with our hands. Little can be evolved directly from our head, without the medium of the hand. Therefore, the work of the hand as controlled by the mind is the most important thing we have to consider. Machinery may be said to be the working of the brain instead of the hand, where we can evolve it and do the work by mechanism. Compared to the cost of doing all the work by hand, the touch of the machine adds but little to the cost of material. The great desideratum, therefore, is to use as much machinery as possible; but as our study is not of mechanism but of humanity, we shall try to analyze hand movements and show where saving can be made after invention has exhausted the mechanical solution.

A great part of our study must be of the mind, since this controls the hand, and, as we have already seen, the eye and the ear have to be considered also. In production the hand as controlled by the mind and

senses is paramount. In distribution the mind is the great factor and the hand but a minor servant.

Nearly all trades and vocations have their ideas or superstitions as to the kind of hand which is adapted for their particular kind of work, so that we start this discussion with a general recognition by the commercial world that the type of hand to an extent influences the work. The piano polisher should have a padded cushion hand. The silk weaver and the watch mender should have long, slender fingers. We have been told of a ribbon weaver who had hands like hams, yet was a very good workman, but he could never get a job unless he stuck his hands in his pockets before he asked the boss. Slender hands are supposed to be essential for the weaver, that he may reach among the threads and snap the broken strands into a knot with lightning rapidity. For the watch mender large clumsy fingers would be a detriment in handling the very delicate parts with which he has to work.

It is difficult to find just what factor the shape of the hand is in the efficiency of the work. It is probably greater than generally supposed, from the fact that it does not have to be consciously reckoned with as often as it might be, because types of hands follow types of work. The great muscular hand always goes with the laborer and does not usually have to be separately considered; and, if the observer will note the fact, he will find similar conditions the case with many other occupations. In our calculations among people in the same line of work we have found that the shape of the hand counts only about 5 per cent in the weight of the average computed for their efficiency. This looks small; but if this science is to become thorough, it must be considered, since every item of individuality

should be taken into account—for, if we have five small factors like this which we neglect, we shall fail in our analysis 25 per cent of the time. Note that we say *shape* of the hand, the speed and strength being further considerations.

As a general rule small fingers are theoretically better for very quick, light piece-work. It is a law of physics that small things can vibrate faster than large things. The short strings of a piano vibrate more quickly than the long ones, thus giving the higher-pitched sounds. The wings of a mosquito vibrate so quickly that they produce a high musical note; the larger wings of the bee move more slowly, producing simply a buzz; those of the humming bird move more slowly still, but yet so fast that you cannot see them. Wing motion becomes perceptible only when the wings are so large that they have to move still more slowly to overcome inertia, as in the robin and blackbird, and the movement becomes distinct only in the larger hawks and eagles. The same laws hold in people as in animals; the smaller the person the more moves he can make, and usually has to make. Heavy bodies, owing to the pull of their own weight, have to overcome more inertia in starting every new movement. It does not necessarily hold that the eagle's wings move at a slower speed through the air—they probably move faster—but they cannot make so many distinct movements.

In testing out this principle we took the speed of several classes of typists in transcribing from copy, and then measured their fingers. To the apparent destruction of all these physical theories, the fingers of the fastest workers did not prove to be decidedly smaller fingers than the fingers of those who were slower; but when we took a class of typists most of

whom had won competitive speed records, the results showed more positively, so far as the women were concerned—their fingers being smaller than human average. Why was this? It came from the fact that *all* fingers are so small, comparatively, that their differences are almost negligible in ordinary work; yet in the sorting out of these girls from many competitions they had been pressed so hard by close competitors that they won only by this little physical trait. These typists had only three-tenths of a centimeter the advantage of ordinary people in the shorter length of their middle finger, three-tenths in their fourth finger, and two-tenths in the little finger. These differences amounted to but 4 per cent of the total finger lengths, and that is about the only weight we would allow in computing 100 points in an efficiency average, this being largely arbitrary. The former head of the Underwood training department believed that the very short little finger, which is peculiar to some champion typists, was a cause of error in contests since a large proportion of the mistakes for which disheartening discounts are made is due to little finger failures; but in our mind, this is more than atoned for by the increased speed possible to the very small finger.

The men in the championship class of typists also had fingers below average in length, but little can be proved thereby since the most of the class averaged about sixteen years of age and had not yet acquired their full growth.

It can be seen from these data that small factors of efficiency, important as they may be in the aggregate, are difficult to detect, since we could find no material evidence in mixed classes that the short finger can make a greater number of movements. However,

this factor is not such as to produce an obstacle in our work, as the point is covered by other tests. If we had failed in the above case in analyzing the particular points of efficiency, the matter would be covered for most cases by the finger speed and dexterity test on our match-board. We might not have known *why* the subject under test made the record, as we did in the above analysis, but we would have had a sure record to depend upon.

The match-board test of *finger speed* and *dexterity,* as formerly described, differs from the arm test only in the length of swing. It consists in getting the subject to fill a row of holes, running from the top to the bottom of the board, with match sticks. The operation consists in picking the matches one at a time from a wooden box screwed adjacent thereto, and conveying them to the holes and placing them therein. The hand travels an average of 10 centimeters from the box to the holes and 10 centimeters back, using nearly all the movements in ordinary piece operations except the filling of

TESTS FOR RIGHT- AND LEFT-HAND FINGER SPEED, AND FOR AMBIDEXTERITY

The above shows a section of the match-board. For the right hand—under A—the subject is asked to place as many sticks in the holes as possible in 30 seconds. The same is repeated under B for the left hand; and then under C for both hands at once, testing ambidexterity. The average for the right hand is 16, for the left 15, and for ambidexterity 24 sticks. These are good tests for piece-workers.

the span of the hands or a long arm swing. The average on this finger test is the ability to fill sixteen holes with the right hand. The difference between the right and left hand is not so great as many suppose, since the average of the left hand in this test is fifteen holes. This is an almost unfailing test in its results. It has been tried mostly on women. The operation needs little explanation, so that few subjects have any handicap in lack of comprehension. It is difficult to fill more than sixteen holes, and when a subject is found who goes above average one can be fairly sure she is a good worker for simple operations, if other tests prove that she has the staying qualities to go with it. There is no guess work in this, as the subject cannot "bluff out" her dexterity. About one girl in ten will fail through nervousness, and we are sorry for this; but, in a large labor market, this is more her misfortune than that of the firm which is considering her employment.

The nervous factor, as we have found in the above test, is the greatest trouble with which the standardizer has to contend, but it is gradually being planed out. In time it will be a very small calculable factor, so that the subject will not have to suffer. Nervousness can already be measured to an extent by the pulse record and by a little apparatus consisting of a metal pin which the subject sticks into a metal hole of larger diameter. The sides of the hole and the pin are each connected to different poles of a battery and to recording apparatus. The subject endeavors to keep the pin from touching the metal lining of the hole, and the number of contacts will to an extent record the nervousness. It can be seen how this can be worked into a calculated allowance or credit. Before we were able

to do away with most of the nervous factor in the match-board, we have had subjects hit the board adjacent to a hole two or three times before they could get a match therein; and yet they filled more holes than the examiner could, and made records above average, showing that even in a nervous state efficient people can work rapidly.

The slenderness of a finger has undoubtedly great effect upon delicate work where small articles are handled. Measurements were made for the width of typists' fingers, and they were found to be one-tenth of a centimeter less in both the men and women of the expert class—evidently a small factor, but of some significance, since the body of the hand of expert women typists has a tendency to be stocky, ranging above average in thickness, although slightly below average in width.

Thickness of hand seems to have some relation to staying power where the hand is likely to become fatigued in continuous strained operations, but this is theoretical on our part. It has not been tested, further than that we have found in a general way that subjects with thick hands seem to have the strongest staying power. It would be interesting to find the result of tests in this matter.

Slenderness of hand, or lack of width, usually goes with thin, delicate fingers, and work which is specially adapted thereto is the same as that suitable for narrow fingers. Our tests have found that width of hand is not necessarily coincident with thickness; in fact, very often the opposite, thus theoretically giving the slender hand as much staying power as the heavier build.

Span of hand is of two kinds; the end span between the thumb and little finger, and the middle span be-

tween the middle finger and the thumb. It is of material significance in a number of piece operations. The end span is essential for wide keyboards like the piano, and it is almost useless for anyone to hope to be a fine pianist without a good, wide end span. The middle span is used in grasping operations such as seizing boxes or round objects. The end span is also used in a side grasp, and in some operations both the end and middle span are used at once, and a wide stretch of both is necessary. The end span is the longest, and where a big stretch is necessary the hand will usually naturally shift to use it. The superintendent of a factory told us that girls with a large span could handle small-box packing operations better than those with small spans, owing to the fact that they could grasp a greater quantity of boxes. This must be the case wherever the quantity is handled by handfuls rather than single pieces. Again, a large span is necessary to grasp a large single piece in a certain manner. We made factory tests on this subject, taking four hand-measurements consisting of: the sizes of the end span, the middle span, the width of finger, and length of finger. The operation was such that in a number of records the width of finger, length of finger, and the end span came out close to a dead average among the best and the worst girls; while the middle span was found to average one centimeter longer in the best girls, showing that this was a factor of their efficiency. This is a good illustration of the working of the *law of extremes.*

Nothing could be more significant than a test of this nature. There are many factory operations where the handling of the work is such as to require a peculiar shape of hand for the highest efficiency, yet this is a

factor entirely disregarded in many organizations. Really efficient girls are assigned to work for which they are physically unsuited, when both they and their employers would make more money if they were better placed, and *little* things like this were heeded.

It is interesting to note that the span of the left hand for men is often larger than the right hand, showing greater flexibility of the left hand. This may be because in our ape stage we used this to hang by, while we picked fruit by our other hand. With a little thought most people will find that the left hand is used for holding operations while the right works on an object, thus we use the left for spanning more than the right. Either the evolutionary theory, or training, as in the latter case, or both, would account for this difference.

AMBIDEXTERITY

Ambidexterity is a subject which we feel should be given more attention in factory operations. Some jobs could be made more efficient if the left hand was used coincidently with the right. Most jobs naturally adjust themselves so that the left and right hands have each their special work, but there are many operations where the left hand is idle and could be working. If a girl were asked, for instance, without explanation, to fill as many holes as possible on our match-board with sticks, she would usually use the right hand only, perhaps using the left to adjust the sticks. In filling a single row they average with the right hand only sixteen holes in thirty seconds. In filling a double row with both hands at once they average twenty-four holes in thirty seconds. Machines could very often be adap-

ted and the material so piled that operators could feed with both hands instead of one.

Mr. Winchester Bennett, vice-president of the Winchester Repeating Arms Company, told us an interesting incident concerning the secretary of the Yale faculty. This professor was known to take down the minutes of a meeting with his right hand and sign diplomas at the same time with his left; and not only this, but he took mental cognizance of the incidents of the meeting and made comments on the boys graduated, all at the same time. Mr. Bennett further told us of an old negro he knew who was a freak and a genius, in his way, at art, for he could draw a woman's face with one hand and a man's face with the other at the same time. Such ambidexterity as these types displayed may be interesting not only as an example, for the faculty becomes vital in its application to some kinds of work, and may mean a difference of 33 1-3 per cent in production.

For work where ambidexterity is already a recognized factor we have two tests. One consists in filling a double row of holes with match sticks as described before; this is a simple speed test for both hands in the same operation at once. The other test is arranged to get a record of *control* over both hands at once, and consists in building up a pattern out of match sticks (as shown on page 213) in a group of holes. Visual demonstration is given to the subject of how he is to use his hands. With the right hand he starts at the upper right-hand corner, and with the left at the lower left-hand corner of the group, and then builds up the design by placing two matches at a time, one with each hand, working towards the center, where he finishes. Thirty seconds are allowed, and a chart with the design is continually before the subject's eye so that he

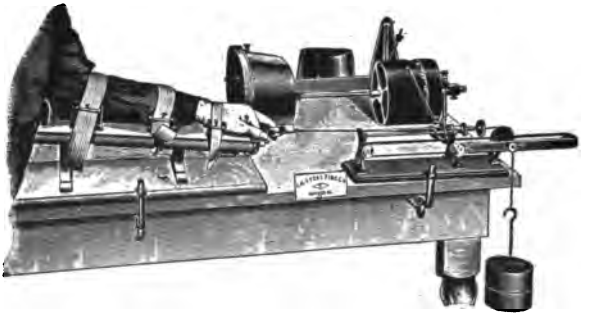
AMBIDEXTERITY CONTROL TEST

In two-hand operations where contrary motions are required of each hand, ambidextrous control is a factor. The subject is asked to make this design on the match-board, using both hands at once. With the right hand the subject commences by putting a match stick in the upper corner to the right, and with the left hand simultaneously fills in the lower corner to the left, and the hands move towards each other in the succeeding operations. Thirty seconds are allowed, and the average runs between six and eight sticks placed. This test is useful in some piece-work operations.

does not have to remember the pattern. The average runs between six and eight, so that six shows below average control and eight above. Owing to the careful explanation necessary, we did not hope much for this test; but, to our surprise, it showed a distinct relation to the actual amount of piece product, where we tested factory workers who used ambidextrous movements, but it was tested on small numbers so that we do not regard it conclusive. While none completed the whole pattern in the time allowed, a number made as high as ten and some twelve.

It will be noted that these two ambidextrous tests are very distinct in character. The first one requires little mental effort, only quick action of fingers and hands. The second one requires distinct mental as well as hand control.

A record of the difference between the right and left hand can be secured from the finger-dexterity tests before described. As will be remembered, the left hand sets up an average of fifteen matches against sixteen for the right, showing little difference in simple finger operations, and showing how quickly the left hand could be trained to do things as well as the right. Few subjects made as high a difference as three in the records of their hands, and the greatest variance was six; but this last was a girl who showed phenomenal right-hand dexterity, making twenty-two, or six above average, and making only one above average for her left hand.



THE ERGOGRAPH

Courtesy of C. H. Stoelting Co., Chicago

The ergograph is used for fatigue tests. The arm and fingers are strapped in a certain position and the fingers pull a weight up by repeated operations, the action being recorded by waving lines on the cylinder shown. As fatigue increases the waves become larger. This test is theoretically useful where continuous pulling operations are liable to fatigue the hand.

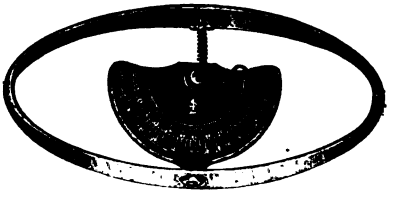
There is a large field for the application of ambidexterity in factory work; and there are advocates for its application to general life, who hold that our one-handed world is all wrong. Certainly, as someone suggests, we could produce better work if we divided it more evenly between the two hands, each hand developing its special lines.

Grip

Strength of grip is a factor in a number of occupations, very small, but yet enough to make a difference between accuracy and guess work. In one line of tests where we were trying to get the results with such delicacy as to foretell what girls could do in piece-work records, we found this a necessary quality to reckon with, although it bore a weight of only 2 per cent in the total of tests. Without this the girls were roughly sorted as good and bad; but, as reference to their piece-work records afterwards showed, this small factor enabled us to tell the slight difference in efficiency between two girls pretty evenly matched otherwise. The operation consisted in closing a package, in which an element of strength entered, requiring a tight grip, and in 9-hours work the fatigue entailed gave girls with the strongest grip a slight advantage.

The machine for testing this quality is called a dynamometer (page 216) as nearly all strength-recording devices are designated. Usually four girls were tested at once, giving a contest impulse which seems necessary to get best results in all strength tests. As many trials as they desired were given and the highest record recorded. The machine is a spring-and-dial

device, and tests are made by simply squeezing the apparatus in the hand. The dials of this dynamometer usually read in kilograms, and the average record for women is approximately 25, as we found in forty tests computed. The record depends on the nationality, so an average must be somewhat arbitrary, American girls ranging around 23 kilograms and foreign girls at 26. An element of grit and determination enters into the effort, so that the record is partially one of mental qualities also; just how much we have not been able to determine. A ratio between this and muscular measurements should give valuable will-power ratings.



THE DYNAMOMETER FOR TESTING GRIP

Courtesy of the Kny-Scheerer Corporation

There are various makes of dynamometers for testing the strength of grip and records will vary somewhat with the instrument used. The range of right-hand grip power varies from 17 to about 70 kilograms. (A kilogram is about 2.2 pounds.) The Naval Academy demands a standard of 53 for a man of average height. A class of 249 Columbia students of average height averaged 52 kilograms. This is hardly typical, however, of human average on a first test as most of these men had some physical training to develop grip strength. Our average runs at 50 on the best record out of several trials in the first test, the subjects being mostly foreigners. Foreign women on jobs which would develop grip made 26. American women on miscellaneous jobs made 23. This test is useful for screwing operations or any job requiring a strong clasp.

The average grip of men ranges around 45 for Americans and 50 for the foreign-born. The latter record was made on laborers.

Hand Measures

To get absolutely accurate hand measurements we believe to be an impossibility, but to get practical averages for a working basis entirely sufficient to classify individuals is perfectly feasible. We have measured one hundred and forty hands for this purpose and have experimented with various methods, finding none satisfactory until we adopted the ordinary scale for feet as used in a shoe store. This we adapted for readings in the centimeter scale, and the result will vary on the same individual according to the force used in applying the scale, which cannot always be controlled by the examiner, some subjects using hard pressure when applying their hands. This may make a difference of one or more millimeters in the readings. However, this, at the most, is only about one-sixteenth of an inch, so that decided variances from average will still come out strong.

The difficulty in getting hand measurements consists in locating definite points to start and finish, and this is overcome by the use of the shoe scale, but as we have pointed out it still does not avoid pressure difficulties. Further inaccuracies may be due to time of day and to measurements taken before and after work, owing to swelling and stretching, and general averages will be influenced if too many of one class of workers are used.

Owing to the circumstances cited, only forty-two of those we measured were considered sufficiently accurate to form general averages; six of these were between the ages of 16 and 18, when the hand is still

about a millimeter (about one-twenty-fifth of an inch) short of maturity, and the whole list is weighted by the expert typist class whose hands are smaller than average. Notwithstanding this, we believe that the general averages shown below will not vary much over one millimeter from correctness, if that. We purposely included some of the immature, as above noted, for they constitute a large class seeking employment; and for all practical purposes their hands are mature, since only the most delicate scientific measurements will usually reveal any departure from the measurements of adult subjects. Let it be further understood that in business we cannot be too academic, owing to the expense factor. The shoe-scale method is accurate enough for all general purposes and a hand can be measured in two minutes with about 97 per cent accuracy.

RIGHT-HAND MEASURES IN CENTIMETERS

	End Span	Middle Span	Length Hand	Width Hand	Width Wrist	Thickness Hand	Width Middle Finger	Length Middle Finger	Length Fourth Finger	Length Little Finger
Men Range	19–25	18–24	16–21	7–10	5–7	2.5–4	1.5–2.5	6.5–10	6.5–8.5	5–7.5
Men Average	21.6	20.9	18.5	8.6	6.0	3.3	2.1	8.4	7.4	6.0
Women Range	18–22	17.5–22	15–19	6.5–8.5	4.5–6.5	1.5–3.5	1.5–2.5	6.5–8.5	6.5–7.5	4–6.
Women Average	19.8	19.1	16.7	7.5	5.4	2.8	1.9	7.5	6.6	5.5

The spans and length of hand in the table of averages will vary with each measurement according to the energy exerted in stretching the hand, so that these figures are only approximate. The length of the hand

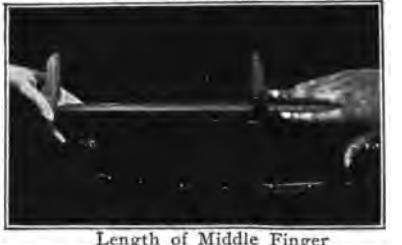
End Span

Thickness of Hand

Middle Span

Width of Finger (Knuckle Method)

Length of Hand



Length of Middle Finger

Width of Hand

Length of Fourth Finger

Width of Wrist

Length of Little Finger

Hand Measures

Our method of taking measurements uses a shoemaker's scale divided into centimeters.

is a difficult measurement, taken from the tip of the middle finger to the lower knob of the thumb where it joins the wrist—a rather indefinite place—but we cannot find a starting point that gives any better results. The methods of taking the measures are shown in the illustrations. It will be noted that in both the men and women the normal hand is as wide as the length of the middle finger, while the wrist is as wide as the length of the little finger, so that a proportionately long hand will be recognized by the length of the middle finger exceeding the width of the hand. A small-boned person will usually be recognized by the length of the little finger decidedly exceeding the wrist measure, though this will not always hold. The heaviness of the bone structure is an important characteristic, according to the observational school of analysts, but we have compiled no figures to find what effect it has on work.

Heaviness of frame can be better observed by comparing the wrist width to the height, the latter ranging from 27 to 34 times the width of wrist in adults, and averaging approximately 29, the smaller figure indicating heaviness of frame.

Proportionate smallness of hand is indicated by the ratio of hand width and finger length to height, which latter ranged from 17 to 24 times the hand width or length of the middle finger, averaging approximately 20.5, the smaller figure indicating a large hand.

The hand could be made the subject of a treatise in itself, purely scientific, instead of theoretical or imaginative as our volumes on palmistry. Standardization will, no doubt, develop such a work. We have merely touched the high spots here. In every factory there is some work especially adapted to left-handed people,

or at least to subjects with good left-hand dexterity. We have seen this taken into account by one superintendent, but have made no studies thereof, yet it is of importance in almost any factory. This is only one subject we neglect. Much additional study could be given to hand control, quality or texture of hand, slenderness of fingers, ratios between the parts, slope of fingers, etc.

We found one piece-work operation where strength and endurance of wrist was an important factor, and we have not yet found a satisfactory test for it. Finger and hand fatigue has been very thoroughly studied in our colleges with an instrument called the ergograph. This machine, though fairly simple for college work, requires too much time for business, since we need easy and quick fatigue-tests.

Enough has been said of the hand to show its importance and to draw attention to a very profitable field of commercial study.

ACTION

We will close the general subject of action by briefly considering it as a sub-head under itself. The observational school of vocationalists take note of a subject's entry into a room, his walk, and general body motions. These observations give some information as to assurance, humility, democracy, and natural quickness of motion.

Some people are great bunglers, always stumbling, always breaking things. Some physical disability is evidently at the basis of this, and it is of importance, since such people may spoil quantities of valuable material and should not be assigned to certain jobs. We

call this *"control"* and have not yet compiled enough records to give any data of value, but it should be a trait easily tested by several means.

Some subjects are jerky and spasmodic in action, continually restless. We call the quality which they seem to lack *"continuity,"* but have not reduced it to test.

Some people are very careful and precise in every movement, taking their time, but sure. Others are quick and sure. We separately rate *carefulness,* but it is a question if this quality with continuity and control may not all be one and the same when sufficiently investigated.

Rhythm is a quality that may repay investigation, since some people have a natural recurring swing to their movements, especially fitted for some work and bad for others. We have all noted the perpetual body swing of some workers, which never ceases all day long. This is a natural body motion, as regular as a pendulum, and, no doubt, has some influence on their work, since they seem unable to continue without it. One observer believes it a great detriment to the work, as using up energy uselessly. It may be so, but we doubt it, since a pendulum uses little energy in its swing, and the momentum may even be beneficial, having the enforcing element of a heavy fly-wheel. Theoretically, rhythmic action should use up less energy than spasmodic work.

Natural and *dramatic* action are simple descriptive terms, and their observation has its application more to office workers and salespeople. Some people are continually dramatizing everything that happens to them. The world to them is a stage across which they are continually strutting; life is one perpetual pose,

and the most menial person an audience. It is one of the side observations by which we can get a line on egotism. The self-conceit that brings this attitude may be useful, since it makes them ambitious, or it may be detrimental, since it makes them overbearing or ridiculous. *Natural,* in this connection, is simply the opposite to *dramatic.*

Grace in action may be a commercial asset. It certainly is to the elocutionist, and it must be so to the professional models who parade in our stores to display hats and dresses to customers. It is undoubtedly a help to any saleswoman in selling millinery or suits.

Any human quality that in any way influences work must of necessity be considered and studied by the standardizer; and, although some of the many traits of action to which we have given consideration may seem insignificant, they all have their place in some kind of work, and often are of more import than we may suppose.

PART III

DRIVING POWER AND MENTAL QUALITIES

Chapter XV

THE FIVE FORCES OF PERSONALITY

Reasoning, Imagination, Egotism, Ambition, Will

Tests: Patient analytical detail, the contract problem, grading problem, expression of beliefs, idealism, materialism, planning, judgment, comprehension, mental courage and patience, imitation, invention, practicality, egotism, ambition, will.

Application to general business, inventors, artists, and authors.

Application to higher workers. Application to low-grade workers a failure so far. Reason, the greatest factor of progress. Ability to think common to animals and men. The cat and Edison. Why children lack reason. Observation of facts the basis of reason. Reasons for failure in reasoning—dearth of useful facts, falsity of facts, lack of courage, prejudice, lack of time. Relation of facts. Reasoning through chance relation, submission and rejection, generalization, induction, and deduction. Logic, the syllogism. Basis of reason in ourselves and material things. Active qualities, quiescent qualities. Danger of the abstract. Philosophic idealist. Chart—basis of memory facts. Chart—relation of memory facts. Explanation of idiots, dreams, imagination. Why minds do not work. Law and definition of reason. Ratings. Philosophic idealists and materialists; both valuable types. Imagination related to reason. Egotism—definition, element of success. Ambition—"in" and "out," active and passive. Will—power and futility, influence of training, outside world, impulse, vitality, fear, and memory. Control of will by popular opinion, social factor, strength, and outside impulse.

UP to this point we have been considering mainly the physical and mental capacities of individuals, as distinct from the forces and qualities of personality arising therefrom. We have considered the mind simply as a recorder of facts of experience and hearsay, without analyzing the qualities which arise from these facts. We have gone a little further in the physical make-up, recording the speed and quality of action since it was simpler to treat it all under one head.

We now come to the five great forces arising from the store of memories and the physical make-up—*reasoning, imagination, egotism, ambition* and *will.* These forces have their main application to the higher class of workers such as salesmen and executives. In our examinations of the lower type of workers, these characteristics have so far shown little influence, although, theoretically, they should be as strong in motive power with the lower as with the higher types; but the law of extremes has revealed such a uniformly low average in the ordinary workers that the comparison of these low averages shows too little difference to make a calculable weight in their work. Possibly when the tests are a little further refined and we have examined a wider range of workers this may change. However, these forces all have an important bearing on the average worker, from the fact that their presence in the executive must react on his helpers. Further, when their presence is found in an ordinary worker, it is an indication that we have found executive timber. Possibly our inability to find that these forces show a material good influence on the average worker is due to the fact that they may even interfere with low-class work. A good reasoner is not necessarily a fast worker, his very type of mind leading him, possibly, to

slow work. The same may be said of a person with vivid *imagination.* While the self-assurance of *egotism* may push a man ahead, he does not necessarily get there by the quality of his work, but by what he makes others believe is that quality. While the above suggestions may appear satisfactory, as explaining our failure so far, certainly one would think that ambition and will would show their influence on the low-type worker. It may be our own fallibility that is at fault; but, so far, the *law of extremes* has exploded these beautiful theories which we confess we had. It may be that the man of will power and ambition so quickly lifts himself out of the mass that we have only the records of mediocrity to work upon, with the necessary failure; or it may be that ambition and will are knocked out of the ordinary worker if he does not get the advance for which he hoped and worked. One must be honest with himself in this science and be continually on his guard lest he hypnotize himself with beautiful theories, without testing them for their *high average* value. Enough is emerging of incalculable value, without forcing results which would cast suspicion on the whole.

That these great forces do indicate executive timber is indicated from two of our will-power tests which are apparently strength tests. These were tried on a set of husky employees, and then two executives tried them. One of the executives was a giant in stature and weight and naturally went high above former averages, but the vice-president of the company was a slightly built man and our set of examiners were inclined to pity his coming records. He made next to the highest record we had yet attained, in one test, and equaled his fellow executive in the other. We can not, however, altogether abandon the belief that tests will be so re-

fined as to show that the five great forces have some calculable weight on the work of the lower grade of people.

Reason and Imagination

Reason is the greatest factor of progress in the world, and it is, therefore, the greatest force in and most important characteristic of commercial life; so this is the most important attribute we have to consider, and it is necessary for us to cover the subject with an attempt to show just what we are talking about, its application, and means of rating it.

The business world has studied machinery, accounting, processes of manufacture and distribution, and various other essential things of its existence, but it has been content, up to the present time, to let its greatest factor coldly alone, and even to regard with suspicion any attempt to discuss reason. It has been considered a thing only for the schools to talk about, whereas the presence or absence thereof among the rulers of an organization is more vital than any other commercial subject that can be discussed. Its study is not open to the uncertainties of many characteristics which are difficult of test, for it can be calculated with the greatest delicacy. The executive who is contemplating the serious step of adding an important man to his staff can find his mental capacity with great exactness.

Historians had a fad some years ago of writing histories of the *people* instead of the kings and leaders of their various epochs. People have no history. History is the story of the presence or absence of reason as represented by the great minds of every age, and

the few who have reasoned have been so rare that all the known men who have contributed to the material progress of the world could probably be listed on less than ten pages such as you are reading. If it were not for these we might still be naked or clothed with skins. So it is with any commercial enterprise. Its history is that of the few among the thousands therein who think, and any manufacturer at the head of a thousand employees knows how rare this faculty is. He knows, as we have confirmed in tests, that on an average he does not have a hundred out of his thousand, or one in ten, who help him out in the thinking end.

Yet strange as it may seem, the *ability* to think is probably universal among all sane animals and men. We do not believe the *process* of a Newton differs materially from that of an animal or a child. The difference lies not so much in any process as in the amount and kind of facts we have in our minds and our patience in their use.

Some men have the faculty of exact observation and the accummulation of vast quantities of memories thereof, and they relate them in a new form which we simply call thought, or *reasoning* ability.

We have put a cat down the cellar at night time with the calm thought that we had disposed of it. In the morning we found it lying on our bed. We can analyze the mental processes of that cat as follows: This cat had three memories; 1, "there is a broken pane of glass in the cellar window through which I can squeeze;" 2, "the bedroom has an open window in which I have lain in the sun;" 3, "I have climbed various things." These three facts simply fell into the relation: "I can squeeze through the hole, climb the vines of the porch and go through the open window."

This is not a syllogism, and you can call it a process if you will; but it is little less than the highest process of thought. Edison invented the incandescent lamp. His mental processes were all based on known facts which others might have related to each other if they had set about it. Edison had three memories: 1, "I have seen electricity make light;" 2, "oxygen cannot consume a substance in a vacuum where oxygen doesn't exist;" 3, "a thin filament will rise quickly to a high heat." These three facts fell into a relation in Edison's mind: "Pass a current of electricity through a thin filament in a vacuum where it cannot be consumed and we have a new kind of light;" and like the cat, Edison set strenuously to work to do it. Are not these two processes practically the same? You will note that the significant elements in both cases were that the facts of knowledge lying in the cat's mind and in Edison's mind were strictly accurate, gathered from their own observations and not mere hearsay. They had not settled into the inertia of the masses who will not tackle a thing because it has never been done and there is no authority on the subject.

Educators say that a child does not think till a certain age; but our explanation of this lies in the fact that children have not had the opportunity to gather sufficient observed facts, and the things told them are often a mass of deception by older people; hence, their relation of facts oftener results in a fallacy but the process of thought is the same as in older people. We believe that animals reason fully as well as men. Given the proper data they will relate them just as skilfully and surely as men; but they have not the data of men, for their minds are not built to keep vast quantities of records; neither are their sense faculties as a

whole sufficiently developed to furnish such data. A dog's smelling and part of his hearing senses are more fully developed than those of men, but sight and feeling are rudimentary. From a dog's standpoint a man must be a fool when it comes to smell; and we acknowledge this, for hunters and the police forces employ dogs as authorities on that subject. A chemist may know more about chemical smells than a dog, but this is because he has data which the dog can not get.

If we form the habit of accurate observation and accumulate great stores thereof and give ourselves the leisure to let these fall out in proper relations, we, too, can be great thinkers, for it is doubtful if either Edison or Tesla has any more wonderful machinery for juggling these facts into proper shape than we have; but mark this—if we wish to do as they we must be sure that we make knowledge our own and do not take anybody's word therefor, and we must have the intensive interest to pursue the kind of facts that are useful in a practical life.

In our tests we cannot get the average on humanity, since our classes are usually almost wholly uncultured or highly educated, as they are gathered to compete for certain kinds of jobs; but it is not unusual in a class of twenty to find not one who can rise to a test in reason, and we may conclude that not over 5 per cent of humanity can classify in this attribute; but we still believe that most have the ability if they will only use it. An illustration of this is seen in charades or picture puzzles. We have nearly always suffered the disgrace of having several people beat us to a solution at these games in any evening company. Some philosophers would be highly indignant at the suggestion that puzzle pictures require great reasoning ability, but to us

they present the real vital problems of reason, and we find no way of wriggling out of the proposition that we have been beaten at our own game. The process in solving a picture puzzle consists in calling up a number of facts and relating them to the picture; rejecting, one by one, those that fail to meet the conditions, until we strike the right one. It is akin, no doubt, to the mental process of a mongrel's rejection, one by one, of the dainties of a garbage can, until his sniff strikes the right one. It is a true analytical process, as great an illustration of the *mental mechanism* of reason as one can find in the human or animal mind, and any set of farmers at a country sociable can beat us at it, showing up our mental inferiority. If then, the ordinary mind has the capacity for reason, what is the matter? We should analyze the trouble as follows:

1. Dearth of useful facts
   - Due to lack of observation,
   - Due to lack of education,
   - Due to lack of sense perceptions.
2. Falsity of facts
   - Due to faith in questionable authority.
   - Due to faith in popular opinion or hearsay.
3. Lack of courage to believe in our own conclusions.
4. Prejudice, due to blinding power of sensual impulse, self-interest or egotism.
5. Lack of time to think
   - Due to excessive industry,
   - Due to excessive pleasure,
   - Due to excessive vacuity.

We can illustrate these five in business. First, dearth of timber knowledge will cause a lumber buyer to be fooled in quality of purchase. Second, falsity of facts may cause a firm to go bankrupt because it did not know the real cost of its goods. Third, many an

improvement has been killed because of the advice of some fellow executive when a man had not the courage to believe in his own ideas. Fourth, the blinding power of self-interest has often induced a workman to spoil another man's product that his own may appear superior. Fifth, a manager who allows himself to be tied to detail has not the time to think out improvements.

It will be noted that not one of the above is a fault of mental process; and although process of thought may be a calculable point at issue, the above seem almost sufficient to account for the lack of reason among people. The points seem sufficiently obvious without further treatment, except "time to think." We believe there is more in this idea than many realize. Thoughts do undoubtedly suggest themselves while we are busy, but they reach their greatest activity when we give them leisure to arrange themselves. Activity either in business detail or pleasure concentrates the mind where, figuratively, thoughts freeze to rigidity. Strange as it may seem, thought or reason is largely a product of chance. The picture of a man at leisure, lolling back in an easy chair, and smoking in solid comfort before an open fireplace, is a psychological presentation of an ideal condition for thought. His physical rest requires no concentration on muscular or sense activity. The thousands of thoughts in the brain roam at will and the more chaotic their condition the better. By the pure laws of chance, formerly unrelated thoughts come together, forming, usually, valueless phantasies, but often important combinations or discoveries.

Facts are valueless unless related to each other. The way to form relations and create reason is deliberately

to make the mind call up sufficient facts for our solution, and at this the mind often balks; or, another process is to create successive physical facts, as the chemist does, and observe the experiments, waiting for the mind to fall on its solution as it observes; or, still another, is to let the mind have a free rein, as in the fireside picture above, and form solutions by chance. Figuratively, we can imagine a big glass globe filled with thousands of slips of paper, upon which facts are recorded. Into this globe a gentle wind is introduced, blowing the facts into new relations. The brain can be considered such a globe and the unguided flow of the blood as the wind, vivifying new thought combinations. The best way to present this idea is by illustration as above and the reader may be tempted to think it literary persiflage. There are other means of mental leisure besides a fireplace. It may be an office chair. You are now asked to try to think of this not as figurative or literary but as a scientific fact, impossible to subject to laboratory test, but you are to subject it to your actual experience and observation. Have not some of the most valuable thoughts in your life popped into your head simply by chance? Analyze your past thoughts. Did not very few of them come through precise and will-controlled thinking? Are not then many important processes of thought due to chance? If so, and if we wish valuable thoughts, the principal method is to store our mind with valuable facts in the line in which we wish to work, and give ourselves thought-leisure to let chance relate them. *System* tells of an efficiency man who says that "some laziness" is a necessary requisite of the highest type of manager. The man who has his desk loaded with business which he spends all day in getting out may be an ideal *execu-*

tive, and we need that type; but we also need the *manager* who will take the leisure to think.

So far as we can call them processes, we have touched on the process of the cat and that of Mr. Edison in drawing a conclusion from several formerly unrelated facts, which we may call *chance relation.* We have touched on what might be called the process of *submission* and *rejection* as in puzzle pictures, charades, and the puppy with the garbage pail. There is one other process, which is called *generalization,* such as the lion uses when he chases anything that runs. The lion, through many observations, builds up the generalization in his mind that all things that run are good to eat. This process works in two directions: the building up of the idea through many observations has been dignified with the name of *induction.* After the idea has been once established, its application to a particular case is called *deduction,* as in chasing a pig when he has never seen the animal before. Logicians may be horrified at calling such processes induction and deduction; and, as a matter of fact, although this is stated as a process in a lion's mind, it is no *conscious* process of his mind, but we doubt if actual reason is any more a conscious process of the mind. All we wish to emphasize here is that given the *facts* of Newton in a lion's mind he could probably *induce* and *deduce* with the same results.

This brings us to a discussion of logic which we cannot neglect in covering this subject. Every science has its peculiar system of mathematics, and the mathematical system of reason is called *logic.* So true has this science become that an actual machine has been originated to do the process of thinking. By assigning algebraic symbols to terms or thoughts and working the

machinery, the absolutely correct answer will be given; but note this point of great significance, viz.—that the answer is correct if you grant the facts with which the argument starts. If the facts are wrong, the answer must inevitably be wrong; so, after all, the *facts* of life are the basis of reason and the process of very minor significance. Like many realms of pure mathematics, the formulae of logic, while true, are of only academic interest. They are largely imaginary and do not represent the true processes of thought used in every day life. The favorite form of logic consists of the syllogism and is expressed as in the following example taken from the American encyclopædia: (1) All metals are elements. (2) Lead is a metal. (3) Therefore, lead is an element. Those who study logic can accustom themselves to this round-about way of reasoning, which is certainly exact and mathematical; but, as a matter of fact, natural and practical reason is expressed like this. "Lead is an element because all irreducible metals are elements." Lead is recognized as a metal by the brain without any process of re-statement to one's own mind.

The weakness and strength of a syllogism lies in the necessity of a very confined definition of a term or statement. Although the above is a favorite illustration of a syllogism, it is a glaring example of its weakness; for if we say brass is a metal we reach a wrong conclusion in fact, although mathematically correct as logic, unless the term metal has been carefully defined —again emphasizing that clearly defined facts are the basis of reason. The conclusions even of the logician have to be reached by the quick process of naturally relating facts in the mind, before they can be more profusely expressed by his formulae. In fact, logic may

be called a branch of mathematics using reasoning processes as a basis, and like all sciences it has its uses. It is a method to prove reasoning by mathematics, but it is not a method of natural reasoning.

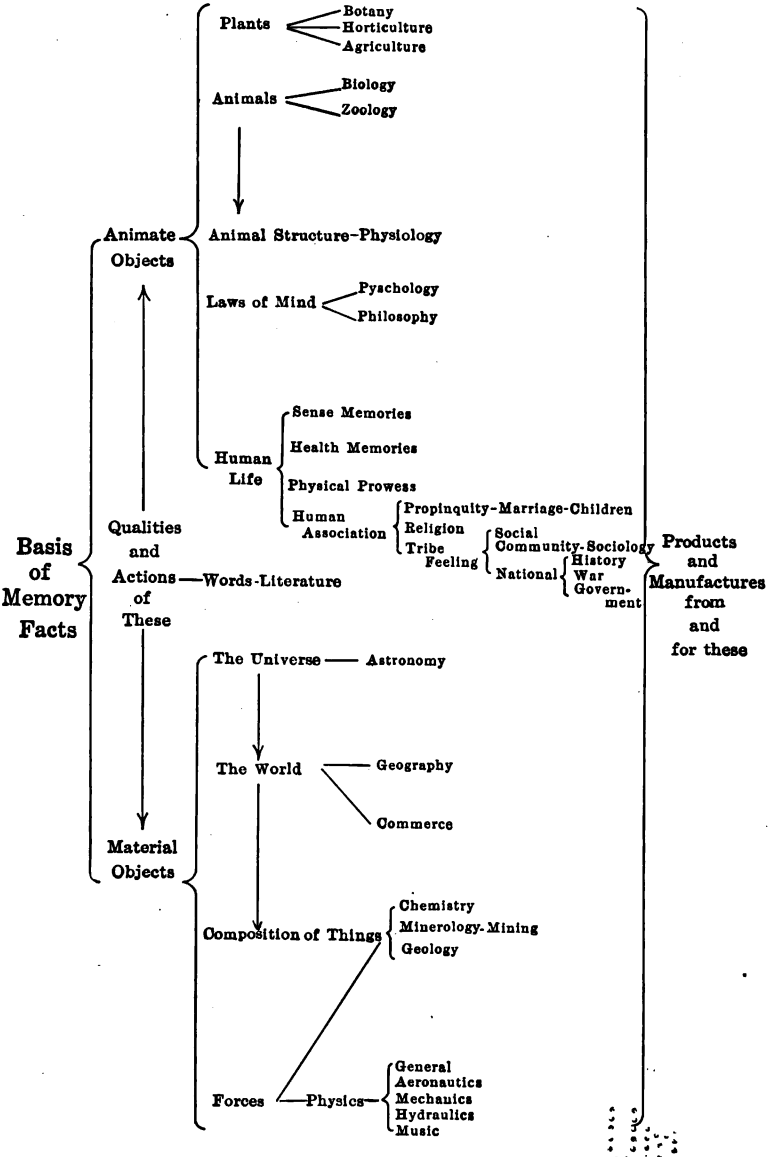
The Basis of Reason

We believe that the great mystery of reason will dissolve if we neglect the process and place its basis not in the mind, but in the outside world of facts from which the brain must get its material for the vast quantity of memory facts stored therein. (See Diagram, page 241.)

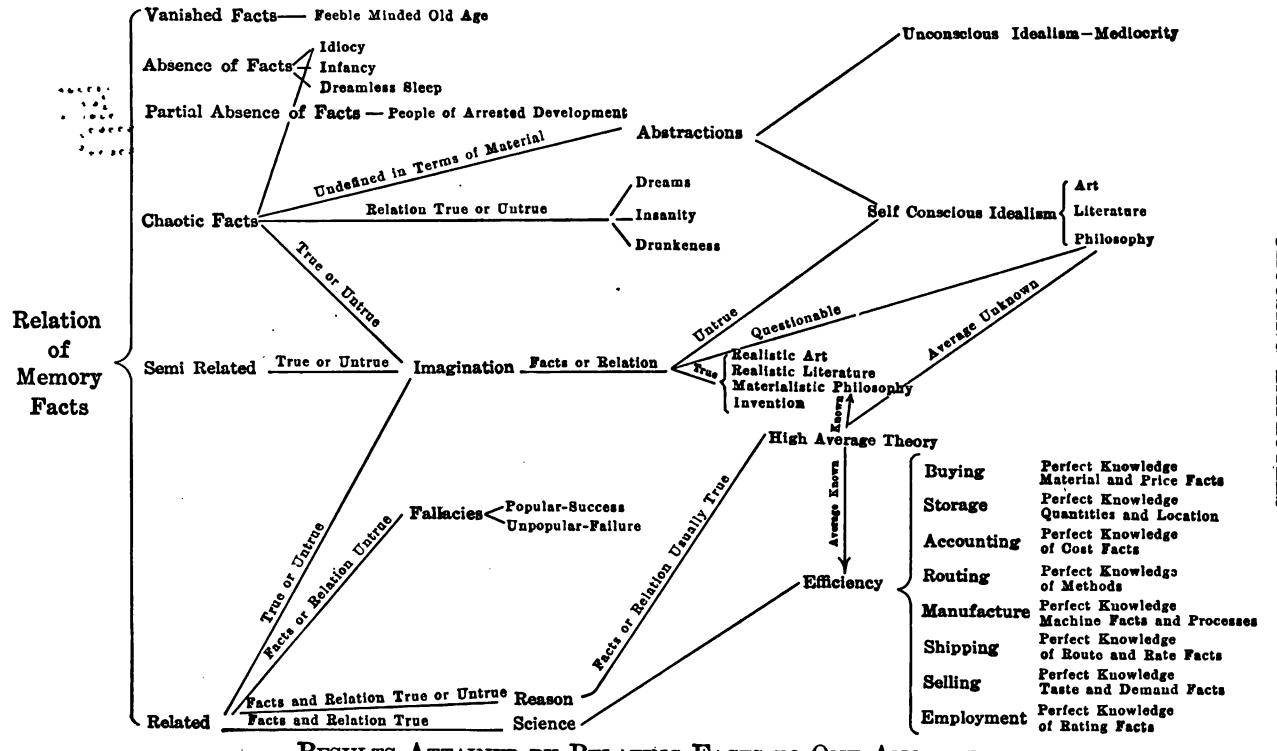
Now these facts are accumulated from observations concerning ourselves and material things. Whatever our five senses have recorded, and whatever conclusions we have reached therefrom, form the basis for new reason combinations. Reason, therefore, has its origin in the relation of material objects, and the action, number, or qualities thereof. The objects are such commonplace things as trees, rocks, horses, men. The action thereof consists of such commonplace things as a horse running, or one man striking another, or giving another something, or robbing him. These actions become qualities, such as speed, combativeness, goodness, badness, which may be called *action qualities.* There are other qualities, such as softness, roundness, and beauty, which we may call *quiescent qualities,* since they express no action but are descriptive of still life. Now some say that qualities have no material existence, and are, therefore, abstractions and can be conceived without any relation to materials or men whatever. We may have to acknowledge that they have no material existence, but material things cannot exist

without qualities. Qualities are simply words used to describe material things, and we cannot conceive of anything without qualities. We cannot conceive of a carpet without texture or thickness. It must have these qualities to exist; but on the other hand, neither can we conceive of texture or thickness as existing without their application to some object, although the object may not have definite shape in our mind. Thickness, texture, goodness, and beauty are impossible of existence without material objects, or at least a conception of some combination of material objects. It is this effort to think in the abstract and to think of these qualities dissociated from materials which leads to such a large number of mistakes and fallacies in life. We acknowledge that a person can make the effort; thus a multiplication table learned by a child and dissociated from objects or written figures as illustrations, is very nearly an abstract conception, but the child that could learn this table and never make application of it to materials would be an idiot.

To our mind the more successful a person is in approaching the abstract the nearer he gets to vagueness and nothing. A buyer who has to buy iron, who can conceive simply of good iron and buy successfully, is a wonder; while the poor, plodding fellow who has to think of concrete material qualities may be no wonder, but a mighty big success. The manager who can abstract the quality of goodness and fill his shop with just *good* machines is not going to be so successful as the man who examines every part of each machine and tests it and gets down to material facts. The manufacturing world has prided itself on its practicality, but it is filled with fairly successful abstractions; and it is the great aim of such men as Emerson, Taylor, Gantt,



RANGE OF FACTS UPON WHICH WE CAN REASON



RESULTS ATTAINED BY RELATING FACTS TO ONE ANOTHER

and the best efficiency men to analyze the abstractions of manufacture into concrete material facts.

The abstract needs further illustration, for it is the grinning monkey of the thought world and its conclusions would be funny if not so serious in consequence in general life and business. An abstract conception is an effort to give a quality a meaning or existence without any relation to material objects. For instance, what is wisdom? The idealist or abstracter might say, "Wisdom is the essence of ultimate truth." It sounds fine but reveals that the idealist has a very hazy idea and cannot express himself in clearly defined language. The materialist would say, "Wisdom is a quality of the brain by which it draws the proper conclusion from given facts." The idealist does not have to relate wisdom to a brain; to him it could exist without brains. The materialist makes it a quality of a concrete physical substance called a brain, which latter is composed of oxygen, hydrogen, carbon, nitrogen, and other chemical constituents.

The philosophic idealist is one who is self-conscious of his ability in abstraction, and he usually pities the materialist; but, as a matter of fact, he does not differ from ordinary man except in his self-consciousness. Abstraction is the great vice of the ordinary mind, for nearly all illogical people conceive of such words as "goodness' 'or "wisdom" without relation to man and matter, giving them an ephemeral existence simply as words without defining them in the terms of materials. In other words, they "rise" to the abstract conception without being conscious of what they are doing. The idealist or the apostle of the abstract by his own self-limitation cannot logically define his words in terms of concrete materials or qualities thereof, and conse-

quently no real philosophic idealist has yet been able to convey to another mind just what he means, and none ever will. Those who in any way make themselves clear have done so by condescending to material examples. We are prone, in reading some abstract work, to wonder why we cannot understand what the fellow is driving at. This is not because we are mentally weak, but simply because no man can make his idea of an abstract conception clear to another mind unless he condescends to commonplace examples, and then it is no longer an abstraction. Without accurate material facts as a basis for our conclusions, we must lead a vague, vacillating life. We never have a firm foundation upon which to build.

It is the effort of these chapters to take the workman out of the field of abstractions and reduce him to a set of material facts.

In the chart on page 241 will be found our conception of the entire field of facts of which the mind can take records, and thus form a basis for *reason*. They cover the field of living things and inanimate objects, and the qualities and action thereof are considered also as memory facts. In this chart we believe we have the basis of all that the mind can contain.

Our conception of the relation of facts to each other, forming reason, is outlined in the chart on page 242. Here we take the facts as accumulated in the former chart and attempt to show their effect on the mind according to their quality and relation to each other. It will be seen that absence of facts accounts for the idiocy of the absolute imbecile, while the idiots who are phenomena of memory have no power to relate the facts, which may be said to be in their minds in a chaotic condition. This state is approached by the

normal person when he sleeps, in which condition his mind is a blank to facts, or they are in a chaotic condition owing to the absence of the outside world to concentrate them. In this state sluggish movements of the blood may vivify several unrelated memory cells at once causing the fantasy of dreams. For instance, we may be traveling to the city in our dream and a dead friend enters the car. Our memory of travel has been vivified at the same time as the memory of the friend, and since the mind is always relating things, the two incidents come together. Again, without concrete outside conditions, the mind wanders in chaos and in dreams we can soar in the air, for gravity is not present to hold us. If this state persists in our waking hours, we call it insanity where the mind is chaotic and relates two dissociated facts such as king and self and the man thinks himself a king.

If, in our waking hours, we give the mind opportunity to drift and become chaotic, the phenomenon of imagination appears. For instance, we all know that the head belongs on the front end of a horse and the tail on the back. They are properly so related. If we conceive of the head coming out one side of the horse and the tail the other side, we call this imagination, and if we do not actually believe it we are sane. If we do believe it, we are insane or drunk. Imagination can be born also of new and proper relations of old facts. From this comes invention, as illustrated in Edison and the lamp which shows an instance where imagination and reason are one and the same. If the facts are true and properly related, it is a practical invention. If the fact of actual need is foreseen, it may be a commercial success.

We will now show from this chart how the ordinary

mind will not work as well as Mr. Edison's or even the cat's. According to our tests in *personal opinion,* the ordinary mind voted that "trusts are a great evil." The mental process must have been like this: 1, "What everybody believes must be so, especially if you read it in the paper;" 2, "Trusts are some kind of company, or something big anyhow, manufacturing oil or steel or something;" 3, "The newspapers say, and so does a fellow I heard talking on a street once, and *everybody* says, that trusts are robbers." These three supposed facts fall into this relation. "Trusts are big companies, or something, that rob people and are a great evil because the papers and everybody says so." The effort here is to put into words a chaotic abstraction. Now you will note that the *process* of thought here is very much the same as Mr. Edison's, the principal difference lying in the falsity and chaotic condition of the alleged facts, which have no real meaning; the result is a haze without a material foundation. A knowledge of the facts here would change most people's attitude towards trusts. The word trust is a vague, horrible semi-abstraction to most people. Belief in such chaotic abstractions has cost us untold misery in the disasters attending the recent attacks on business.

We may be permitted to propose the law of reason: *"Reasoning power varies directly as the accuracy of our facts, the quantity thereof, and the opportunity we give the brain for their relative arrangement."*

Our definition of reason would be: *"Reason is the action of properly relating correct memory records."*

Having laid our foundation, we have an intelligent basis upon which to discuss reasoning power in its commercial application. Any tests which will rate the

accuracy and quantity of facts in a man's mind and the accuracy of his decisions, should be a good reasoning test.

Patient Analytical Detail

Our examination as to mental range shown in the ten problems in Chapter I is a very good test. It is so arranged that the subject who is tested must have a knowledge of facts beside mathematics. Nobody without a good reasoning foundation can get more than six of these problems. Our general information test, in the employment blank, shows the man's aptitude at picking up accurate commercial facts. No one can possibly make over 70 in the personal-opinion test, previously given, unless his facts are fairly accurate as recorded in his memory.

As the type of facts which interest a man varies, so will his reason vary, and an examination of the kind of facts will thus show if a person's interest is such as to fit him for a particular kind of business. For this reason every business should have its particular kind of reasoning test. The following is an example of the type we have used for trying out efficiency men on the Emerson force. It will be noted that the data are incomplete, and even apparently unreasonable at times, giving a subject wide latitude to disclose the range of his personality and giving side markings on other points.

The Contract Problem

We give here what we believe to be an interesting problem involving many of the situations confronting a manager or efficiency man. Kindly give us your solutions, showing your

method of getting them, and explaining why you arrived at your decisions.

A chemical concern decides to put up in cans their own baking powder, which they had formerly sold in bulk to wholesalers. For this purpose they build an annex to their factory in which to handle the tin-cutting or stamping out of the cans, and to pack the filled cans. They have already installed machines to make the cans and fill them automatically, and they call on you to organize a system for,

Buying and estimating amount of tin to be used;

Buying and estimating amount of lumber for cases and size of same;

Disposal of any waste;

Hiring and organizing girls, and planning layout for packing;

Training of the girls for their jobs;

Fixing price of product.

Below will be found data upon which to work, and in the absence of information you are to assume the data. If you have no knowledge on the questions involved, it will not be necessary to delay your answers till you acquire the same, as your method is the thing we are after, and you can assume the knowledge as above, making note of the assumption; and stating how such knowledge or tests as you could make might change the situation. You are to assume further that the conditions of the first order, as below, will be continuous; and that you are free to arrange ideal conditions for the work.

A. Your first order consists of:

2,000 gross of cans, the bodies of which are 4 inches in diameter and 8 inches high.

4,000 gross of cans, the bodies of which are 3 inches in diameter and 6 inches high.

No extra allowance in height need be made for the ridge to hold the lid, or for clamping on bottoms.

The lids of the two sizes will be made of pieces 1 inch wider than diameter of box, to allow for stamping the rims.

The bottoms in all cases will be made of pieces 3-10 inch

wider to clamp on body. The lids add 1-10 inch to height of closed boxes.

Assume that the available supply of tin comes in sheets 14 inches by 20 inches, weighing 1 pound, and costing 5 cents each at factory door. Assume that 5 per cent of total finished cans are used as samples, or do not pass inspection, and that the blanks from the stamping machines come out perfect without loss through inspection. Show your layout for cutting sheets, and give the net cost of tin.

B. What size wooden packing cases for above order would you make? What kind of lumber would you use? What would be total net cost of wood for cases, provided lumber cost $10 per thousand at factory?

C. Allowing 2 girls to pack the smallest cans, how would you choose and hire them? Assume that cans are delivered from labelling machine in mixed and random condition, and have to be transported to the new factory annex in any way you specify. Show a layout of packing tables or system for packing smallest cans. Diagram same in a sketch, showing position of girls, position of unpacked cans, position of cases, means of access and egress. Assuming that unskilled help is worth 10 cents an hour for 10-hour day, what system of payment would you install and what is your estimate of cost of packing the smallest cans in above order?

D. Write out your written or oral instructions to the girls as to how they are to pack the above order. Diagram if necessary.

E. Assume that the labor cost of packing the total product is twice the cost of packing the small cans. Assume that, outside of cost of lumber, tin, overhead, and packing, the actual cost of the filled cans, for their product and labor, is 1 cent a piece for smaller, and 2.5 cents for larger size. What considerations would there be in fixing price? Fix price for finished product, and show balance sheet for the contract, assuming anything necessary to complete the statement.

Such a test as the above is very conclusive but is expensive to make, since it takes a long while to examine

the papers. We usually give general reasoning tests at first with but one defined answer, easy and cheap to mark. This sifts out applicants, and those with any ability can be kept for the specific trade examination. For instance—in a technical job—anyone making less than 60 in the Popular Opinion Test or less than 50 in the Patient Analytical Detail Test would not be considered on the final test for it would waste money to try them. In tests such as the above it is the best policy to let the good men set the standards, rather than to try to set sandards yourself, thus making the answers a self-working-out of the *law of extremes.*

As an example of a quick tryout for reasoning, we asked 70 subjects, mostly typists, to answer the following question:

"A teacher wishes to grade her pupils *accurately* on a percentage basis according to the quickness with which they can read the same page in a reading book. She finds that Mary reads the page in 6 minutes, that John reads it in 4 minutes, that Harry reads it in 3 minutes, and that Ethel reads it in 2 minutes. Show below an exact arithmetical method of marking them."

Using the same mental classifications as in the Personal Opinion Test, the results were as follows:

Those of low mentality, thirty-five in number, with *chaotic* minds, could not even attempt it. Nineteen of the *sub-normal* and normal or *average* type either guessed or gave Mary the highest average. Thirteen of the *intelligent* type gave logically calculated answers on a ratio basis. Three of the highest type gave calculated solutions based on an assumption to start, or stated legitimate reasons why the example was impossible of any one definite solution without such an as-

sumed basis. For a very high-class position only these last three would be considered if our test time were limited; but any test based on a single elemental question is unfair to the subject, since, in this problem, several may not have expressed themselves through modesty, or have been unable to think through nervousness. We have had very high-class people give Mary the highest rating in this problem, so a single question is not conclusive.

Women have made as high a rating as men in this test; showing that, with the same facts, there is no difference between the sexes in the *process* of reasoning.

If one accepts the idea that facts, and not process, are the real foundation of reason, it seems to settle the great controversy as to which of the sexes has the higher reasoning power. We found a highly intelligent woman utterly helpless before the Contract Problem previously given. Her averages were zero therein. This was not because she lacked reasoning power, but simply because she had no knowledge of the facts of a man's world. It would not be difficult to originate a reasoning problem in which most women would average higher than men, if we made the facts those of a woman's world.

On reference to the index card previously given, various sub-heads will be found under *Reasoning* which require some ratings. If a person is strong in *idealism,* we simply underscore that item, and we do likewise with *materialism.* Our judgment in this is determined by their answers to their *beliefs* in the employment blank. If they concur in nearly all the questions asked in the first paragraph, they are classified as idealists; and if they concur in most of those of the second paragraph, they are doubly underscored. The

philosophic idealists, who know what they are doing, usually have too much reasoning power to concur in any but two statements of the second paragraph. These concern the relative freedom in the United States compared to other countries and their own average ability. The philosophic idealist is usually a very valuable man notwithstanding his extreme views in some things. Most philosophic idealists are usually self-deceived and are really more materialistic than average humanity, and in this lies their safety, notwithstanding the hard things we have said about them. The materialist crosses out the second paragraph in about the same manner as the philosophic idealist, but in addition crosses out many items of the first paragraph, denying belief, especially, in Christian Science, hell, the devil, and Jonah and the whale. The materialist is a strong mental type and a valuable man.

A cheap examination as preliminary to more expensive trade tests consists simply in the use of this employment blank. We can tell in a single glance the general mentality of a subject by the way he has marked his belief, as outlined above; and this is no mere theory of ours, but has been tested out quite thoroughly by the *law of extremes.*

Planning ability, the next sub-head under *Reasoning,* is a calculated rating from the Patient Analytical Detail Test in Chapter II; but in special trades it should have a distinct vocational rating which can be made from such tests as the Contract Problem previously given.

Judgment receives a calculated rating based on the number of beliefs crossed out in the employment blank.

Comprehension is the faculty of understanding what another says. We do not always give a separate test,

but deduct one point for every question misunderstood in the general questions. Where there are no written questions, as in the match-board tests, we give instructions for setting sticks in the holes under one section. These particular instructions are a little difficult to comprehend, and a person's relative ability will be determined by the number of points he gets. Lack of comprehension we have found to come from super-intelligence as well as from vacuity. Some highly intelligent people formulate their minds while a problem is being stated, their imagination jumping to a possible conclusion, which causes them to neglect all the conditions given. The comprehension test in Chapter II has proved very successful for executives and clerks.

Mental Courage is the power to believe, even against the opinion of authority or popular belief, and can be rated from the questions on belief in the employment blank.

Mental Patience is the faculty of pursuing a subject relentlessly to its final solution. This cannot be tried by any quick test. A person who patiently and carefully answers *all* the questions in the ten Patient Analytical Detail Problems in Chapter I has this mental patience. Many abandon them when part way through. A person who painstakingly reduces the tin cutting in the *contract problem* to its final economic solution, has this faculty.

Imitation is the lowest element of reasoning power. In the match-board tests, the examiner has a large board with large holes therein, in which he inserts large sticks in the form of a design. The subject imitates him as nearly as possible on his smaller board; only about one in ten succeeds perfectly, and the relative success forms a calculable rating. The *Comprehension*

match-board test will show how quickly a new employee can learn from oral instructions. If the subject is lacking therein, he has a final chance to show his prospective employer how closely he can imitate motions. If he fails in this also he is almost hopeless. These two tests are used principally on the lower type of workers, while the two corresponding comprehension and imitation tests in Chapter II are used on higher types.

Imitation is here legitimately classed under reason, since it requires observation of facts and the proper relation thereof, which, according to our belief, forms the basis of reason. It is the lowest state of reason because usually the facts are present before the mind without the effort to recall them, or they only need relating as observed, without

Imitation Test

If an employee is dull in comprehending language, there is still a chance if he can imitate an action when shown. This test will give some idea how quickly and accurately a subject can learn a new job. The examiner has a large board, an enlarged duplicate of section Q of the match-board. He proceeds to set up a design with large sticks on his demonstration board, and the subject tries to imitate him as above under Q. In a test of forty-six subjects only seven were able to do this perfectly, and the whole made a record of 76 per cent in correctness. Reasoning seemed to have something to do with this, as the people who looked intelligent nearly all made from 90 to 100 per cent.

originality in seeking new relations. It may be affected by poor sense perceptions, but this does not invalidate its rating, although it may show means of remedy. Psychologists have discovered that poor sense perception materially affects imitation and reasoning, many defective children having been cured by this discovery, since their apparent lack in mentality was due to the dearth of facts, which their defective senses had failed to record.

Imagination

What has been said of reason may nearly all be said of *imagination,* except that the latter knowingly may place facts in wrong as well as right relations, through fantastic pleasure therein. This phantasy has a commercial value in cartoon work, comic pictures, and idealistic art and fiction. Otherwise, it is practically the same as reason, the popular conception allowing it greater latitude.

Our definition of the subject would be: *Imagination is the power to place facts in new relations whether true or untrue.*

Invention is a sub-head under *imagination.* Many make the word synonomous with imagination, but since the latter word covers the ground of general originality, it is best in our classification to confine *invention* to *new mechanical relations.*

The only test we have used for *invention* is that referring to a conveying and packing system in the Contract problem already given. A number of solutions have been presented, and we rated those the highest that succeeded in eliminating the "human touch" most successfully and simply.

Practicality is naturally an element of both *imagination* and *invention*. It receives no calculated rating as yet, being simply underscored if the subject shows ability therein. In the above problem the subject who involves a big amount of mechanism in his solution, while he may be ingenious, is at once rated as being impractical. Simplicity is of even greater import in practical life than in the aesthetic.

A record of the *patents* or *patents pending* will naturally reveal a subject's inventive ability, and at the same time causes him to be looked on with suspicion by the business world, as men of great ingenuity are supposed to be erratic. This suspicion may be justified with half the inventors, but the fallibility of the one passing judgment is a large factor in the case.

Egotism

In the discussion of the five great forces and other qualities which affect a man's work, it is well for the reader to free his mind from the idea that these are a set of "essays" on human characteristics.

If the reader gets that idea the matters discussed will be of only passing interest, whereas it is our hope that every topic will appear as something vital to a man in the business world. It is hoped that the experiments to test these qualities will actually be tried in employment departments, and that suggestions made will be elaborated into set trials, so that this new service of Labor Standardization will become itself standardized and of practical use in the business world.

With these thoughts in mind, we will take up the characteristics of Egotism.

Egotism is the quality of self-appreciation.

This is a rather broad interpretation of the word, and it is necessary to bear in mind that we give it this wide meaning, or what we say will be misunderstood. The general use of the word is for excessive self-admiration, but for our purposes we wish it to be understood that it covers the whole range of a person's conception of himself, from humility to extreme vanity. We make it almost synonomous with self-confidence. Mr. Henderschott, of the National Association of Corporation Schools, says that self-confidence is engendered from past attainment. We amend this, with his acceptance, by saying that it is the result of past attainment or what a man thinks he has attained. Egotism or self-confidence then becomes one of the great driving forces of personality and success.

When great egotism is combined with strong will power a man is almost certain to batter his way to the front. Whether he should be there or not is another question. Undoubted capacity, with indifferent will power and small egotism, is very often shoved aside to make way for the man who is taken at his own much over-valued estimate. Fortunately, great self-esteem and will power are often combined with exceptional capacity, and this works out well for any firm who finds such a man in an executive position.

A good measure of egotism is usually necessary for the successful politician, at least for the kind who seeks office. Its over-estimation is not a necessary quality of the party boss, who usually knows too much about himself and others to be overly conceited. He sits back with a sense of humor and uses the other kind.

The successful clergyman who gets to the metropolitan pulpits is not usually of the meek and lowly nature of the Master, but one who can pompously assert, with

a mighty beat on the pulpit, that 2 plus 2 make 5—and "get away with it."

The Standardizer of Labor should be able to speak authoritatively of what constitutes a formula of success, and no doubt such formulae will be worked out, but you will note we use the plural. There is no one formula for success. There are many. A person may be lacking in all qualities except great egotism, and, so long as he convinces the right persons, he will be successful. One may be lacking in all but will power and achieve prosperity. Another will get high through using his social connections; still another achieves success with little else but sterling honesty; another through great planning ability. Thorough knowledge of, or scientific training in, a subject rarely will attain great success therein without some of the other requisites. We feel safe in saying that egotism alone may attain great things. Egotism and strong will power together have a greater chance to win; and these forces combined with the above elements will be almost an infallible formula to achieve great things.

To go far a man should have at least sufficient egotism to be self-confident, and he is almost hopeless if he goes to the extreme of under-valuing himself.

We have no certain test for egotism. At the present time it can be fairly well estimated by the observational method, consisting of the readings of facial characteristics, and by leading a man into conversation. It will come out to some extent by getting him to write the story of his life, formerly referred to. Some firms have systems of markings which are purely personal estimates for characteristics. We object to personal estimates usually, but some system may be introduced into a marking for egotism by giving so much

for the erectness of the body and further ratings for the carriage of the head and shoulders. To this may be added data secured from the conversation and the life history.

About twenty-five years ago we read a very ponderous scientific article which proved conclusively that man would never be able to invent a successful flying machine; and we believe that anybody's prediction that egotism and other elusive characteristics can never be calculated is of much the same value as that article. Psychologists have already invented apparatus that measures the emotions, Surety Companies can foretell honesty with 98 per cent accuracy, and these achievements are prophetic of what the future will probably bring forth in other characteristics. We can recognize super-egotism when we see it, but a satisfactory means of calculating it has evaded us. We have tried skilfully worded questions, answers to which would give a basis for markings in this subject. We had little faith in the result but often unexpected things will come from such trials. It is as good a principle in standardization as in finance to "try anything once," as Gates did. These questions revealed the fact that the most humble appearing people would claim the most astounding achievements when looking for a job, so the questions proved valueless. This does not mean that the method may not eventually be used, if more skilfully handled and under different conditions.

At present our ratings for egotism are what we call "estimates" as distinct from "calculations." We often ask a man to rate himself in various traits, and if these ratings correspond with our own findings and he is of average modesty, he is estimated at 7. Strong egotism shows distinctly in the face and conversation

and higher ratings are given if the subject so reveals himself.

We have carried out no conclusive investigations of the sub-headings under egotism, such phases as teachableness, desire of praise, self-confidence and respect for authority.

Ambition

The fourth great driving power of personality is *ambition.* It is of importance if the employer is searching for executive material. A revelation should be sought not only of the amount of ambition but of its variety. When confronted with the question in an employment blank: "What is the principal thing you want to do in life?", quite a number of employees are at an utter loss for an answer, and this is one of the blanks most frequently left unfilled. We who have ambitions can hardly conceive of a make-up without high hopes, yet the utter loss of some to comprehend this question seems to indicate either no imagination or the lack of aspiration. Certainly the action of many employees seems to indicate that their ambition is to do the least possible for their employers. On the other hand, we must acknowledge that many employers do little to encourage ambition.

A man's effort to do business for himself indicates aspiration. The holding of office in societies is another item in his favor. The fact that he has risen to foremanships or executive positions in former jobs shows some ambition, and his ability to formulate an answer to the question is strong evidence that he is not hopeless. All these points are brought out by the questions in our blanks, and form items for rating.

These ratings may be of no immediate use, but they form a basis of reference for the future when executive timber is under consideration. Ambition is an essential for success, and every firm should be organized on a basis of automatic promotion to use ambition as a constant spur for better work. The superintendent of one of the largest piano factories in the country was telling us about his most successful foreman. This man was ignorant of book knowledge but knew much of human nature, and he used ambition as the motive power to get the best work from his men. He would tell an employee that the wages on the job to which he had been set were, for instance, $10 a week and if he worked all his life he would get no more, *but* if he made good on his job he would promote him to Bill's job at $12, for Bill was doing well and would soon be advanced to a $15 job. He kept all his men watching the job ahead, and had organized his own department on this automatic promotion basis as a spur to ambition.

The kind of ambition is of great importance. Is a man's aim solely *himself,* or is it *his work?* We know the manager of a large factory who has the *internal* kind, for he considers every question from the standpoint as to how it is going to affect him instead of his company. Fortunately, success for his company means success for him and his attitude has not materially interfered with his work, but we believe he would be yet a greater force if he could attain a larger view. Another and very successful firm deliberately fosters this attitude among its employees and promotes jealousies among them, for by this means the manager thinks he will know all that is going on and will get the best out of his men by setting them against one another. The executives of this company have taken me aside and

confidentially told me how they were the main forces in the organization but some one else was getting the credit. Figuratively speaking, these men opened all the drawers of their desks in the morning to see if some fellow executive had concealed a bomb therein. Yet, strange to say, this firm is marvelously successful, although run on an idea entirely opposite to that of other great firms whose effort is to promote fellowship. We cannot help believing, however, that the success would be even greater if the manager would center the interest *on the work* instead of on competitive employees; for, undoubtedly, many good plans have been suppressed in this organization for fear someone else would get the credit.

The self-centered person is always looking *within,* for there his ambition lies, while his opposite is always looking *without.* Edison would have accomplished very little if self-centered, for he looks without, at the work to be done, with such intensity that he loses all sense of self, of hunger, of even day and night; and we feel safe in saying that the greatest things in life have been accomplished by those who looked *without.* For this reason we have made the entries in our index card of *"in"* and *"out"* under the head of ambition to denote the type. As yet we have made no tests for this trait, but observation of a person's actions will soon enable one to fix this quality. People of the "in" type are not always actively selfish, but totally indifferent to everyone and everything that does not intimately concern them.

Another important consideration in ambition is its activity. Is it *active* or *passive?* Does a man actively go to work to attain it, or does he simply sit still and *passive,* dreaming about it? We may get some data

on this from the history of his life; from his independent business ventures; from his attitude and address, or from his facial characteristics; and finally from the questions asked on the employment blank. We simply underscore *active* or *passive* on his card record and the discerning examiner usually has little difficulty in classifying him from the above points.

Will

From the time we were put on this earth we were surrounded with uncontrollable conditions that made or wrecked us. True, we may have attained our ambitions, but our ambitions were made for us. True, we have attained our *wills,* but our *wills* were controlled. We entreat the reader not to paw the air at this point, for hope will evolve before we are through.

Practically everybody has the will for wealth, but 95 per cent remain poor. Many millions in Europe have the will for peace but are forced to slaughter and be slaughtered.

We are prone to think that we can do as we choose, that there are no limits to the range of our irresistible will, yet the fact remains that we are chained to our little round of action. The most that wealth can buy is to go on wheels instead of legs, to live in a larger house but still a house, to dine in state but still to only dine. We can scoff at food but we have to eat it. We can fight sleep but we have to take it. We can despise money but we all use it. We are put here without consultation and we leave against our will, and whatever the future may be, we now only gaze at the stars and cannot tread the great white ways of space.

The factors controlling our will against our volition

are: early child freedom; the whole outside world; our uncontrollable sense impulses; our strength and vitality limits; social and physical, moral and religious fear; and memory. Referring back to our personality diagram, everything before or preceding *will* has its influence.

First, as to *early child freedom.* The beautifully obedient child of whom some parents are so proud may be ideally fitted for a menial job all his life, but if he has permanently learned the lesson of obedience from his parents, he runs a small chance of having the will to advance himself very far in life. Breaking the will of a child may be convenient from the parents' standpoint, but may wreck the child's life. It will be thus seen that the power of our will may largely be determined, against our volition, by the amount of control our parents exerted over us, at the start of life.

Second, as to the *outside world.* This binds the limit of our will power. A negro born in the centre of Africa, without even the knowledge of white people, does not know there is an emperor's palace at Berlin, and there are too many outside controlling factors in the world ever to allow him to own that palace. We are born on the earth, and no will power of a living earth-man has yet allowed him to tread the plains of Mars.

Third, as to our *uncontrollable sense impulses.* We have the power to see, and a theoretical power to pluck out our eyes and deny ourselves this sense amounts to zero, if none exercises it. Our sole theoretical freedom lies in the apparent ability to refuse to look at certain things, but this also amounts to zero if such things as *repugnance* or *social fear* control our will. The will in this case becomes as free to move as a scale, moving

delicately down or up according to the motives put in the balance, and wherein does freedom lie in this? So all the sense impulses can be analyzed.

Fourth, as to *strength* and *vitality limits*. An anaemic person could not conquer Willard or Johnson, no matter what his will power. The power of our will is thus largely determined by our physical and vital make-up, usually involuntary gifts. A physical trainer has said that every man has his physical limit beyond which he cannot be developed.

Fifth, as to *social, physical, moral* and *religious fear*. We may have great physical and mental will capacity, but it will be rendered helpless by *social fear,* or the dread of what others may think of us; or legal, moral or religious retribution. Pure, uncontrollable, physical cowardice may counterbalance our natural desires.

Sixth, as to *memory*. Whatever may be our present impulse, all the facts of past memories lie in our minds, to control them either by caution, futility, or relative surety of success.

We will now take two instances of actual will action. Suppose you or any other man were on a country road, miles from any habitation or people, and you saw a roll of bills lying in the way before you. Would you pick it up? If out of one thousand normal people every one would pick up this package, would there be much doubt that their will had been controlled by some of the above factors, mainly the memory of what money is and can buy? The second instance relates to the disposal of this money. Who would be free therein? The very religious person would be *controlled* by his training to try and find the owner. The ordinary person would fear that he *might* find the owner. The miser would be *controlled* by cupidity to save it, and the spendthrift

by many impulses to *spend* it. Who, in fact, would deal with this money with an absolutely untrammeled will? Freedom of will may be a theoretical possibility, but it is as hard to conceive of uncontrolled will as of infinity. It is an abstraction which some minds may be able to conceive but, as we have said before, our mind always falters before the abstract.

One might conceive from the above that it is hopeless to will anything, that will is a dead factor. By no means. It is vital; and of all the forces, the great moving factor of our lives and of the whole commercial world. Our whole contention has been that our will is *controlled*—not that we have no will, for we most decidedly have, and our hope lies in getting at our will by indirection, by the use of a Machiavellian policy. If we have a weak will through physical weakness, it may be bolstered up by exercise or heavier eating. Simple lack of nutrition may be the difficulty, and we can *control* it not by direct willing but by furnishing it with physical fuel. Helplessly intemperate men have had their wills reinforced against the habit by accepting religion as a *counter-control.* A weak will may be bolstered up simply by citing examples of the power of the will, by praise, by developing egotism. These become *memory* controls of the will upon which the person can depend for inspiration.

It was necessary that we have a thorough understanding of the will before we could discuss its relation to commercial life. If the employer becomes fully imbued with the idea that men's wills are not mysteriously obstinate, unknown quantities, that they are free for him to mould, and that they are possible of rating —then much can be accomplished in the commercial dealing with will power. We have already pointed out

the influence that can be brought to bear by controlling *popular opinion,* which becomes a *social* factor as above; by such revivals as Billy Sunday's, which is a type of the *religious* factor; by providing a substantial lunch as part of the wage, partially controlling the physical strength factor; by the $5 a day Ford idea which becomes an *outside impulse.* Piece and bonus systems come under this head, since they make the work as much to the selfish interest of the employee as of the employer. The very fact of an employee working for another man is an example of controlled will, and if this idea can be changed into one in which the employee feels he is working for himself, the control is much stronger.

While *will power* is a commercial asset, it may be a detriment if developed to an inordinate degree; for, in a sense, *obedience* is the opposite of will power. In the army will power is a virtue in an officer and a vice in a private. In a commercial organization obedience may be of greater import than will power. Unless an employee has the intelligence to use strong will power it may prove a detriment to him. Many competent boys have a hard time in their first five years of business to adjust their will power to this necessary obedience, and some never reach an adjustment.

As to tests of will power, Mr. Bruce, in trying out traveling salesmen, purposely makes the process as long and difficult as possible in order to find their staying power. Another expert in employing inside salesmen for a retail tobacco company presents a discouraging array of conditions to his prospects, such as long hours, working holidays and nights, and all the adverse circumstances he can think of to see if he can discourage them. Our own test for patient analytical detail

has a will factor involved; for the weak man will give up when he is part way through. Data can be secured from a prospect's history of himself and his former record as an executive either in societies or business. In the personal-opinion test already given, people of weak will powers vacillate in their answers or leave the questions blank. As to physical will power, any strength endurance test will furnish a record. The one we most depend on is the holding of a 6-pound weight at arm's length till the strength gives out, but it has not proved entirely reliable owing to the difficulty of computing a ratio between the time and the actual strength. Will power in this test may be even a greater factor than strength, but just how much we have not determined. *Will* also enters into the grip test on the dynamometer.

A purely calculated *will* test is probably possible from the foregoing tests; but the results, so far, are not sure, so we still classify a rating therein as simply estimated.

Chapter XVI

ACCURACY, MENTAL SPEED, SKILL, CONCENTRATION

Tests: Mathematical and composition. Imitation and estimating. Co-ordination. Easy and hard questions. Adding. Concentration—letter crossing, match-board, and writing.

Application to engineers, motormen, chauffeurs, pilots, bookkeepers, cashiers, accountants, inventors, executives, technical men, machine operators.

Modern demands for accuracy. Skill a factor of speed. Skill a combination characteristic. Various types of concentration—continuous concentration, periodic, absorbed, range object.

OF the business elements of human character, *Accuracy* is of extreme importance. The general tendency of modern business methods is to pay more for the perfection of product than for the speed at which it is made. Possibly this has much to do with our high cost of living and therefore may be decried by some. It is a disgrace in modern life to appear in badly made clothes; therefore, every seam must be run true in our garment trade. The housewife will buy nothing but perfect fruit; therefore, the producers must see that their product is packed without a blemish. While the economist might call this fussiness, certainly it is obvious that we can raise no exception when

the builder of a skyscraper demands that every steel beam shall be delivered true to the smallest fraction of an inch, and every block of marble shall fit in its place like a glove.

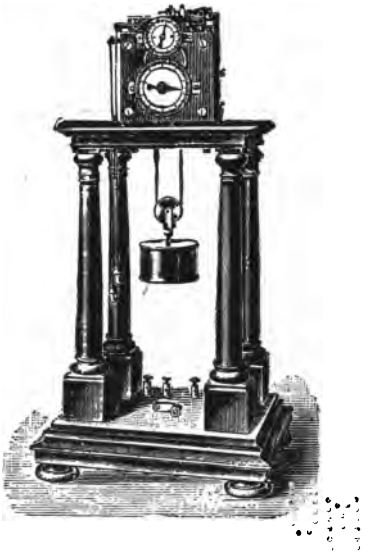
Accuracy is a large topic and can be tested to the greatest nicety. It is of two kinds: first, purely mental; and, second, that in which the mind controls the fingers. These two elements are determined by a combination average formed by a number of records and, as such, we do not give them final rating under any one test. In our work it has consisted of the addition of the markings we found in accuracy of mathematical and composition tests for the mental element, and in imitation and estimating tests for the finger element. The National Cloak and Suit Company give a rating on the ability of the subject to copy a composition with absolute fidelity to every detail. *Mathematical accuracy* has already been treated and is rated under that head. A means of rating eye and touch accuracy will be treated under "Estimating Numbers," page 286.

Mental Speed

The fields of mental application in business are so various that practically every branch will have to have its specially applied test.

Where mental speed is combined with hand action and quick sense perception, the eye-and-hand and ear-and-hand co-ordination tests, already given, are useful. The psychological laboratory test, which consists in giving an eye or an ear signal to stop a delicately adjusted chronoscope, is the most accurate. Theoretically, these tests should be useful in rating the quick response of engineers, motormen, chauffeurs, pilots,

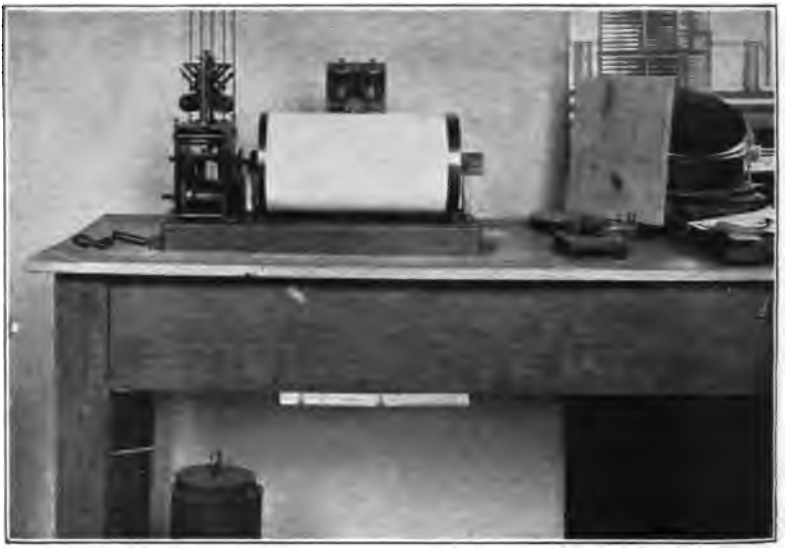
etc., to signals or danger; but as yet they are largely on a theoretical basis from the difficulty of applying the *law of extremes* or trying out the best against the poorest men.



THE HIPP CHRONOSCOPE

Courtesy of C. H. Stoelting & Co., Chicago

The chronoscope is used in the same method as the chronograph for recording within one-thousandth part of a second the exact time of mental and physical reactions. Instead of the record being recorded on a cylinder it can be read directly from the fractional second dials shown. Eye or ear signals are made by the examiner, which start the clock-dial mechanism and the subject presses a telegraph key in response, which stops the second hands. The dials will record the exact time of the subject's action. The chronoscope and chronograph are theoretically useful in all jobs requiring quick mental action, such as train dispatchers, engineers, and machine operators, where quick stoppage is essential to save waste of valuable material.



THE CHRONOGRAPH

The picture herewith is a chronograph used by Mr. Edison. It can record many mental and physical operations with the exact time thereof. It consists of a cylinder around which is wound the paper for a record, clock mechanism to revolve the cylinder at a certain rate, a writing point to make records on the paper, magnets to bring the point in contact with the paper, and telegraph keys for giving signals and operating the writing point. Mr. Edison has found the relative mental alertness of a number of his staff by this means. The subject tested is placed in another room, where he operates a telegraph key. The examiner presses a key which causes a click of the subject's receiver and at the same time marks the paper on the cylinder. The subject on hearing the signal presses his key, which makes another mark on the cylinder. As the cylinder has revolved in the meantime at a specific rate, the distance between the two marks shows the speed of the subject's mind in acting and enables us to calculate this speed to the thousandth part of a second. By demanding different responses to different signals the test may be easy or difficult.

In the realm of pure mental speed, subjects are naturally slow in fields where they have little experience. To find a common ground, we have given sets of twenty questions requiring the easiest answers in the field of knowledge, followed by five of more difficult interpretation.

Our first method of giving these tests was to submit the questions, typewritten, turned upside down on the desks of a class of subjects. At a signal they turned the papers over and began writing the answers. The time was set by a stop-watch so that the fastest could not answer all; thus when the signal to stop was given, the number of questions answered furnished a numerical mental speed rating. This was practically the same as we now give in the pamphlet tests, Chapter II.

Naturally, the finger speed in writing formed an element here. We have tried this method on classes of typists, classes of executives and classes of clerks. The *law of extremes* showed it had no material influence on typing speed; but thirty-six semi-executives made 9 as against 8 for thirty-five clerks. Some very high executives, however, made very low records. To make it a pure mental test, we have recently taken each subject individually and the number of answers given orally in 20 seconds furnishes a mental-speed rating on the two classes of questions, but individual tests are expensive as against class work.

For bookkeepers, cashiers, accountants, etc., the adding of twenty columns of figures of ten digits each, given in Chapter II, furnishes a dependable rating; but it would not be just to test the mental speed of general humanity by such means as they have not the practice that a professional has therein.

Skill

Skill is a widely varying characteristic and usually would have to find its application in purely trade tests. As an illustration of how this is, we quote our own experience where we found the average skill of a typist to be the ability to write 38 words per minute from copy with 97.7 per cent accuracy. Skill is really a combination average of speed and accuracy, and there is no necessity of rating it when you have the other two.

Concentration

The importance of this element to the business world is obvious. Some kinds of work require continuous absorption in a single task. Others require an acrobatic mind that can jump from one thing to another.

Again, the mind that can be continuously concentrated for several days on one subject to the exclusion of all others, may not be the mind that could stick to this subject for years at a time.

Types will vary in all directions from these points of departure. In many positions, a man's peculiar aptitude under this head means fitness or unfitness for his job.

Experiments to determine various kinds of concentration and to fix the boundaries thereof must, of necessity, be very delicate tasks. We may have men who will devote whole lives to the solution of the various qualities and natures of concentration as applied to the active work of life. Men may arise with that element of concentration themselves which made the Greek professor famous who devoted an entire life to the study of the preposition, and then mourned, as his

end approached, that he had not confined his study to the dative case. Such a man will give us a very valuable treatise on concentration.

Continuous Concentration

We will take the first division of the type, that of *continuous concentration.* We mean by this a type of mind that can settle down for life to do one thing, such as our Greek professor. Whether rightly or wrongly, this quality has been the most sought in business up to the present time. The one series of questions which you can find on nearly all application blanks is that referring to the time which the proposed employee has spent in other positions. The employer wants to know whether the quality of sticking by the job, and usually a particular kind of job, exists. These questions also relate to experience, and have constituted almost the only source of written information demanded of applicants till recently.

Some employers, like the New York Life and the New York Central Railroad, prefer to take very young and inexperienced men who have not already acquired the wandering habit. These they expect to stick to their jobs until death or the pension roll gets them. These companies consider that they can get a steadier set of employees by this policy.

We do not feel that the type of man who can so settle down is of the highest character, yet where the work is of a routine nature, no doubt this is the variety of make-up best fitted for the job. An organization composed entirely of this kind becomes, however, very conservative and tends to fight all advancement, but fortunately for the companies with this idea in mind

some men of the versatile type always work into the organization. These either succeed in getting themselves fired or in battering their way into executive positions so that the virility of the company is conserved.

As for tests to find this quality, we can suggest nothing better than those already employed, but the subject is one which will, no doubt, be solved from a combination average made by the sum of other characteristics.

Periodic Concentration

As before suggested, it is difficult to mark boundaries for the different varieties of concentration. It may be found that certain time-limits exist for certain characters beyond which they lose interest in any topic. We all know people who for six months or several years become intensely enthusiastic on a topic; first, it is Christian Science, then New Thought, then Woman Suffrage. One by one they take up fads and there can be no doubt of their concentration while they are on the topic; but interest wanes and they are off on something else.

Such a type we call Periodic. It is by no means such a bad variety as the above comments might indicate. Many inventors have this type of mind. They will conceive a wonderful idea and work it out for months until the thing is solved in their own mind, and then they lose interest, even though they have not developed it to the extent of public use. There is one very famous inventor in the United States who does work for electric companies, yet left to himself, he would never finish anything. We would not be as far advanced in the electric world to-day were it not for

the fact that the companies for which this man works have to wrest the invention from his hands and give the finishing of it to a man of the more plodding type. The man who is possibly the most famous inventor known would probably confess that his is the periodic type of concentration; that he could never have kept at one thing all his life, and that he often forces himself to finish his product for the public by sheer will power.

Many executives are of this type, taking up one organization problem after another, solving it, and then, having put it in force, losing interest in the topic.

This type of mind, when combined with creative faculties, forms one of the highest possible types; but, unfortunately, many of this make-up never find a place in life and become classed among the failures. From this analysis executives will probably recognize several of their force who have this characteristic. Such types, with creative instincts, may be of incalculable value to an organization and should be given one problem after another to solve, never being assigned to routine work.

One of the reasons why this subject of concentration should receive extended scientific investigation is that, in our belief, the periodic, creative type of man should have a greater place in our business. We cannot blame executives for being suspicious of him, for he can cause considerable loss to any organization if not properly handled. The investigator will do a good work who can find the rules whereby we can find the elusive qualities which would make this man safe in certain positions.

It goes without saying that the periodic type, without creative instincts or some other redeeming virtue, is useless in any organization. To this class belong

many of the floaters. A floater, however, is not necessarily hopeless. I have seen many men of this type who were entirely unfitted for the particular lines they had tried, but could have made good if rightly placed. Their unfortunate experiences made them lose ambition and faith in themselves.

Absorbed Concentration

This may be a type by itself or may go in combination with either of the two former types.

Absorbed Concentration is the faculty of losing all sense perception of things occurring about one except for the one occupation, mental or physical, in which one is engaged. This has often been miscalled *absent-mindedness.* It is the most decided present-mindedness one can conceive. The mind is there, but sense perception of the outside world is gone, sense of one's body is absent, and all the faculties are concentrated on one particular thing. The absent-minded man may not hear a gun go off nearby; his mind cannot record irrelevant sounds. He will look through his best friend, to the thought so far in space that both eyes look along parallel lines to infinity. His mind has not the power to record irrelevant sight phenomena. The soldier will be wounded in battle and not know it. His mind is fixed on revenge, or absorbed in striking his own blow, and is powerless to record the pain of another's blow. The scientist often cannot tell you what he has just eaten for a meal. Taste can make no record on a mind absorbed with a great problem. This is not absent-mindedness, but the fully absorbed, concentrated mind.

People who lack this power of absorption are continually asking others to stop making noises, or to "go

away and let me think." Their minds cannot work when there is much to occupy their sense perceptions.

To be successful in chemical or mechanical engineering, or any scientific occupations, this power of absorption is essential. We might go so far as to say it is unwise to engage in any mental occupation that so lacks interest to us that we can never become absorbed therein. He must be a very inefficient man who can boast that he has never been "absent-minded."

This power is capable of mathematical calculation, but of necessity cannot be fully tried out with any one test. In order to be of any value the test must be of something in which the person under trial has interest. We have used the old psychological test of crossing out all the *a* letters a subject can find in a selection of printed copy. First he is required to cross out under conditions of no outside disturbance. Then, in comparison to this, he is required to go through the operation with further copy, but in this case various disturbing factors are introduced, like the playing of a piano. In one test I put on my hat and paraded before a class and then knocked it off and had quite a complicated time getting it. Strange to say, the class accepted the matter very seriously and it produced little effect upon their records. The disturbing factor must be one, unlike this, that can always be uniform and thus form a basis of comparison between classes; in other words, like all experiments, it must be capable of standardization in itself.

Impulsive Concentration

Impulsive concentration is the ability to jump quickly from one idea to another. It may be a vice or a virtue.

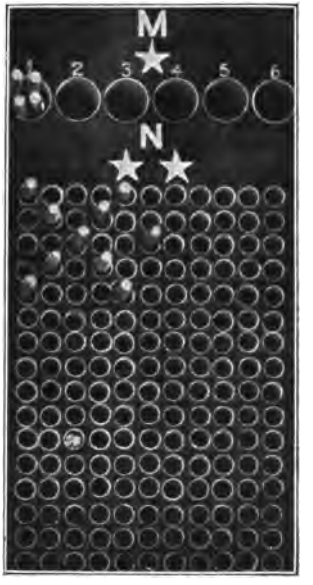
As a vice, it becomes an impulse over which a person has no control. Every outside subject of life, by coming before the senses, controls the action of that person till a greater impulse takes the field. He lacks internal motive-control. He is like the kitten which sees a moving string and must jump for it, since no other power exists. That string must be chased until a flea begins to bite. That flea just be scratched until the bite is assuaged. Then life becomes aimless until some other object intrudes. Such people are useless for any occupations where the mind has to be fixed They can become fair automata in piece work and some classes of machine work after the motions thereof become automatic so as to need no other control.

This faculty becomes a virtue in occupations which of necessity continually change all day, and in which the person can quickly pass from the old work and concentrate upon the new. It is a virtue where strong motor-control exists with it. The mind must have power to concentrate instantaneously and for a few instants give the new idea its whole attention. The name of this quality might be called a misnomer but for the fact that intense concentration must really exist while the impulse lasts.

Executives of certain types must have this faculty, for new problems are coming up every moment of the day, requiring instantaneous concentration thereon, a solution, and then abandonment for the next.

Tests for a limited range of this quality can be made on the match-board described in our introduction. A certain section of the board consists of numbered holes. Another section is made of non-numbered holes in which the purpose is to form a design of sticks. A chart showing this latter section is exposed, with a pattern

outlined thereon, in dots, like an oil-cloth design. The subject is to set up the design outlined on the chart with sticks, but every five seconds on the wall appears a large number. He is immediately required to place a match in the corresponding numbered hole in the numbered section of his board, and then to resume his design. While he is performing these operations in the numbered holes and in making the pattern, every fifteen seconds an easy problem in addition, like 1 plus 3, is given out. He is to take the result (in this case, 4) and place that number of matches (four) in a big hole on another section of the board. He is thus required to do three



Test for Impulsive Concentration

When the question comes up as to the ability of an employee to handle several machines where he formerly handled one, the problem consists in the ability to jump quickly from one thing to another. This test constitutes one of the elements theoretically essential to such work. During the test a design is exposed on the wall like that started in the holes under N. During the entire test the subject is to work out this design in match sticks, but every 15 seconds he is asked to do an easy problems, like 3 + 1, and to put the result, in match sticks, in the big holes under M, according to the number of the problem called out. A further confusing element may be introduced by calling out a number every five seconds between problems, on which impulse the subject is to find the corresponding number in a numbered section of his match board and put in a stick. Many subjects will neglect one operation entirely. The results can be figured in different ways and are not conclusive when unchecked by other tests.

things practically at once. This test is useful (but not conclusive) for machine operators where a number of things which require attention are simultaneously happening on a machine or where an operator attends a number of machines.

An interesting test of this kind is to give a subject copy to transcribe in a certain time, and coincident therewith to ask orally and receive answers likewise to a certain number of questions. A test preliminary to this would have to be made as to his natural ability at transcribing without the disturbing factor. A test of this nature, with results, is given under *Concentration* in Chapter I.

Range of Concentration

The range of concentration consists in the number of things upon which a person is capable of concentrating his mind. The range must vary with the interest a subject has in the things, or in the mental ability to grasp them, and must of necessity be more descriptive than mathematical. If we test a man's ability to concentrate, it is of use also to know the kind of things in which this ability is active. This type is wide open for study.

Object of Concentration

Some people have but one aim in life and it is well to know this. What this is may be of great importance to the employer, but it has already received treatment under the heads of *ambition* and *interests.*

Chapter XVII

ESTIMATING, HANDWRITING, HANDSHAKE, MUSIC

Tests: Estimating, marbles, lights, match sticks, touch in fabrics and marbles, games, and eyesight.

Application to postal clerks, baggage men, piece-workers, artists, masons, chemists, soldiers, chauffeurs, shipping and mailing clerks, inspectors, carpenters, draftsmen, tailors, cutters, sign painters, crane handlers, salesmen, typists, linotypists, glass blowers.

Estimation calls in many faculties. Use in mechanical trades, weight, numbers, eye-sight method, eye and touch method, touch, plumbing, time, and aim. Hand-writing is nothing conclusive. Handshake—strong, medium, flabby, quick, clinging, and slow.

ABILITY to estimate covers a wide range of subjects and, unlike most of the other characteristics, cannot be treated as variances of a single faculty; for widely ranging mental and sense powers all have play in estimating weight or pressure, numbers, space, the trueness to a plumb line, lapse of time, or straightness of aim.

Estimating in some cases touches more on training in technical and trade conditions than the other characteristics heretofore considered. The keenness of an employee's ability in this line means often the saving of much expense in time and money. The postal clerk

who can estimate weight does not have to use as much of the government's time as one lacking this ability. Baggage masters would need more assistants if they had to weigh every trunk they saw.

Many piece workers could not earn nearly so much if they had to count the number for each package, where pieces are bunched in dozens. They acquire the skill to estimate instead of counting pieces. We shall later see the necessity of keen space estimating to the artist. A mason who had to plumb every brick would make slow progress. In chemical or mixing operations a sense of time is often of much importance. Trueness of aim is of great import to the soldier and the chauffeur. All these are examples of the wide range of estimating.

Tests for estimating are of great importance in standardization work, and records can be made with accuracy.

Estimating Weight

Firms handling psychological apparatus have light weights especially prepared for making tests, but we have simply used marbles in getting our own records. The subject or person under test is allowed to hold a dozen marbles in his hand so as to get the feel of their weight. Then he is handed marbles in a light, covered receptacle—a closed cone of paper or toy bucket will do—and he must estimate the number of marbles he holds. This is tried ten times with varying quantities and the record determined accordingly. Marbles in some respects are more satisfactory than exact weights, since it is confusing to a subject to be asked to give his result in ounces or grammes, a knowledge of which is

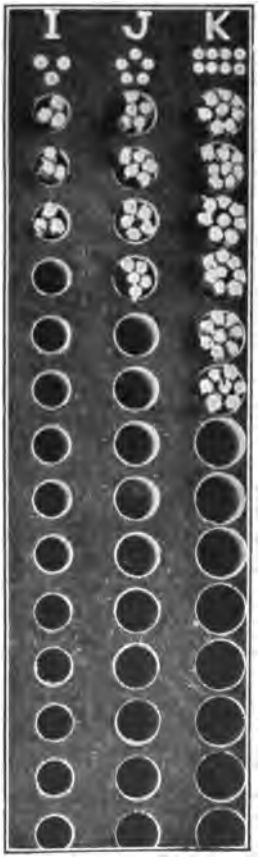
not at all essential to the test. This test is useful for a shipping or mailing clerk, who should be able to judge weight approximately without weighing every package. In some mixing and packing operations this test would also be useful. Inspectors of closed packages should often have this ability so that they can tell if an employee is short on his packing.

This test can be amplified according to the problem, by preparing packages in multiples of units of ten pounds or kilograms, but all of the same size. Our work so far has not led us into the heavier tests.

Estimating pressure is much akin to estimating weights, so that we have made no separate investigations.

Estimating Numbers

Eye-Sight Method. We have used marbles in making this test also. The examiner encloses in a small box a number of marbles, ranging from four to twelve. The lid is raised clear and shut instantly and the subject is required to tell the number he saw. The results of this are a little unsatisfactory, since conditions nearly always vary, and in all tests it is absolutely essential that conditions shall remain constant. We hope someone will perfect this test by having a battery of twenty electric lights, any number of which may be made to flash on and off always in the same time. Records could then be taken in classes, any number of subjects competing, thus not only standardizing the conditions but securing the advantages of time-saving that always accompany class work.



Eye and Touch Method. We have used a series of holes on the match-board for the test mentioned under "Accuracy" in the preceding chapter. Record is made of the speed and accuracy in filling eight matches in the holes. This is a very quick test, and like all match-board operations can be reduced to class work, thus saving much valuable time.

A test such as this is important to all piece-counting operations. Some girls have the faculty of always grasping the right number, as in cigar- and pencil-bunching operations, while others rarely acquire it. The average on this test, taken from forty-six subjects, in class work, is the ability to fill ten holes with eight matches each in two minutes. Natural accuracy is the ratio of the number of correct bunches to holes filled. Any method of filling is allowed.

Accuracy and Estimating Test

The subject is given thirty seconds to put three match sticks in as many holes as possible under I. The test is repeated for five sticks under J, and then two minutes are allowed for filling in eight under K. The record is taken on the last. This is a good test for accuracy and speed in operations such as bunching cigars, pencils, etc. An average of ten holes was made on forty-six subjects. The Americans ran above and foreigners below average, and men made better records than women. The test is not conclusive by itself.

Touch

Touch is a recognized essential in various lines of business, as material is often estimated by the feeling, where sight fails in showing its qualities. Especially is this so in all kinds of fabrics. Also many small articles have to be estimated by touch. We have done very little in this line, but would suggest that sample books of various woven fabrics could be used in testing subjects, their ability being estimated by the number out of every ten they can pick right with the eyes closed. A distinction should be made between touch memory and delicacy of touch, since subjects acquainted with the feel of materials will choose them more from memory than by keen perceptive ability. To test the latter quality we have used ten marbles, five of which were perfect in shape and five had irregularities. The subject was allowed to take the ten in his hand to observe and feel them. They were then taken away and mixed. Then, with the subject's eyes closed, they were again given back to him, and he was required to pick out the five irregular ones and hand them to the examiner, the number picked right constituting a numerical rating. Each set of marbles so used will create its own standard, so that it is useless to quote averages in this unless a set of marbles with standard irregularities were in general use.

Space

The match-board can be used in estimating space. The examiner places ten sticks in holes at varying distances apart in a vertical direction on a model board, and the class is asked to estimate and place the same

number on its own boards in corresponding positions. We have used ordinary ruled paper for this test by simply marking off ten varying spaces on the ruled lines and asking the subject to do the same on a like sheet, by looking at our copy which is placed in close proximity. His grade can be very accurately determined by placing a tracing cloth over his record with the spaces marked thereon, and reading the variance beneath. Placement within one-sixteenth of an inch of exact point is allowed, and the average correctness runs about 6.2. A similar test is given under estimating in Chapter II.

Accurate space estimation is very essential for carpenters, draftsmen, artists, tailors, cutters and many other occupations, wherever measurement enters. The workman in these trades often makes a mistake in the use of his scale, and unless he or his foreman has a true eye valuable work may be spoiled. We have known draftsmen who could set off small measurements as accurately by eye as by rule and save much time in that work thereby. A sign painter told us he would "fire" any helper who had to measure the parts of a letter. There is many a position requiring accurate measurement that would be lost if the workman did not soon acquire such skill that he could abandon his rule.

Plumb, Time, and Aim Estimating

We have made no investigations in these subjects. They offer an interesting field for discovery in their application to business. All the mechanical trades are dependent to an extent on trueness of eye or the squareness of one line to another, and more particularly in the building trades to the plumbness of a line in its re-

lation to the horizon. The estimation of time enters largely into chemical and mixing operations. Aim is, of necessity, an essential in military practice, but it has applications in business life in the handling of derricks, conveyors, trolley and railroad cars, automobiles, and in piloting boats of all sizes. Men who record in the employment blank their fondness for shooting, baseball, bowling, pool, billiards, or shuffle board (especially if they underscore several of these games where we list them) are evidently those who take special pleasure in all games of aiming, and should do well in the above occupations. Some firms have great difficulty in getting men who can handle the traveling cranes skilfully, and for testing such operators we doubt if any test for the aiming quality could be found better than the ordinary shuffle board, where the test consists of stopping a weight short of a given point, or quoits, where the elements of hitting the point and stopping there both enter. In all work where aim is of importance eyesight should receive careful attention.

Handwriting

This subject is one of the sub-classifications of action, and is one of the mental qualities where finger action is intimately connected with the mind. In fact, it is a question whether there is not a sub-braincenter in the hands to take care of these characteristics, since it was said of a noted blind musician that grey matter similar to brain cells was found at the nerve centers of his fingers. We have made no original investigations on the subject of handwriting as a revelation of character, further than to compare the theories of various writers with examples of the writing of

people whose characters we thoroughly knew and to find the results almost always very faulty. This is a subject which we believe never can be solved by theory, but only by statistics, and we believe much of value can be found therein. For all we know it may be solved already, but we have not been fortunate enough to find anything conclusive. The theories on the subject are certainly picturesque and make good reading for popular magazines, but their principal value is literary, so far as we can find.

Handshake

Many people already judge character by handshake. We give a rating by simply underscoring the qualities on our index card as *strong, medium* or *flabby; quick, clinging* or *slow.* The good business hand is strong and quick. The good-fellowship hand is strong or medium and clinging. The uninterested handshake is naturally flabby and slow. Handshaking may be made quite an art, and is undoubtedly of some importance in classifying salesmen; but just what weight we have never had the opportunity of estimating. There may be danger of misjudging a man by his handshake, so that we do not place too great a dependence upon it.

Music

Music is the last of our mental classifications in which the element of finger action enters. We believe it important to make note of any ability in musical lines for the sake of future compilations and for side data on other qualities. When we have enough records we will be able to decide authoritatively whether

or not the idealistic make-up, as expressed in a musical temperament, unfits the subject who is being rated for certain positions, while adapting him to others. Aside from any consideration of temperament, the finger skill acquired by playing musical instruments is useful in various occupations. The good pianist has quite a start towards being a good typist, linotypist, or for any position where quick finger action and hand control are essential; so that by glancing at this record on the employment sheet we shall gain some measure of a subject's ability to acquire quickly facility in certain jobs. In positions requiring great delicacy of finger control and estimation, a violinist or banjoist should have more than a fair start from the skill already attained in playing these instruments. Is it too humorous to suppose that good cornetists, trombonists, and flutists would make good glass blowers? Or, from their fine lung power, in the majority of cases have good staying qualities in all occupations where fatigue is a factor? We hope we have shown that music is a factor in business. If one still doubts we can but remind him that Shakespeare was probably the greatest psychologist that ever lived, and is authority for this statement:

> "The man that hath not music in his soul,
> Nor is not moved by concord of sweet sounds,
> Is fit for treason, stratagems and spoils;
> The motions of his spirit are dull as night,
> And his affections dark as Erebus:
> Let no such man be trusted. *Mark the music.*"

Thus we can see that Shakespeare was the first to command us to give a rating on music.

Chapter XVIII

ARTISTIC SENSE

Tests: Taste in wall paper, drawing.

Application to cloth-makers, milliners, designers, jewelers, fashion designers; workers in terra cotta, furniture, metals, glass decorators, flowers, photography, moving pictures, bookbinding, advertising, feathers, embroidery, ceramics, fixtures. Draftsmen, salesmen, artists, buyers.

Range and application of art. Types of people in artistic trades. Art is gradual transition, illustrated by church, house, human figure, paintings, and nature. What is an artist? Popular taste a money factor. Newspaper artists. Commercial application.

THE world has fallen into the habit of treating artistic sense as something apart from commercial life, but it is very intimately bound up with many classes of business, and we believe it should receive more attention.

Art is at the foundation of the clothing trades, millinery, printed goods, figured silks and cretonnes, jewelry, fashion patterns, terra cotta, furniture, ornamental iron, bronze and brass goods, stained glass, decorations, horticulture, photography, moving-picture productions, high-class bookbinding and printing, etc., and it even enters into such formerly prosaic businesses as plumbing fixtures and shoe making. In fact, you may think of almost any line of work and you will

find that art is becoming a factor in it in modern life; if not in the actual form of the goods, it becomes essential in labeling, cataloguing, or advertising.

Probably more than half the people employed in artistic trades have no intrinsic love for them as artists. Anyone glancing over the "help wanted" section of a newspaper will find that milliners and flower makers are almost frantic in their desire to get help in seasonal times. We believe that if these classes of business made a test of the artistic ability of an employee before giving expensive training they would have an easier time with their help. It seems obvious that workers in this line should love the artistic, yet it is probably a fact that less than fifty per cent of those employed in these lines have much artistic sense of expression. This same is true to a great extent in the feather, embroidery, ceramic, photographic, ornamental iron, and light fixture trades; in fact, in any business where the grade of work is affected by artistic ability. How many dress or suit designers have this faculty? Probably less than half of architectural draughtsmen have any high ability in this line. How many of the "art-goods" salespersons in our department stores, such as those handling rugs, decorations, millinery, period furniture, or any line of goods where beauty is the buying impulse have even ordinary attainments?

We do not mean to say that people with artistic sense should always be given preference in these trades, but of two persons whose abilities are equal in trade dexterity or salesmanship, the one with the most artistic sense should certainly be chosen where art enters in any way into a business. As it is, you will find a man with an aesthetic soul selling shovels, where

in the same store he would be happy selling rugs. Many a boy with an inspired soul has been put at mechanical draughting by ignorant parents because he could "draw." He has been condemned to make wheels all his life, when he might have reveled in visualizing the dreams of home builders.

Possibly one of the greatest fields for the standardizer is right here, for myriads of people who are unhappy in their business have artistic sensibilities and despise the sordid surroundings of the unfortunate positions in which they have been placed; while, on the other hand, the artistic trades are crying for just this kind of people. It will be our business in this chapter to pull apart and analyze art and artists. Before we analyze the characteristic before us, we can appreciate it better if we understand what art is.

Analytically, art is "gradual transition." This looks like a group of perfectly good words without sense; but, psychologically, it expresses it fully. We will endeavor to turn the definition into something intelligible. We see a church in course of building. It gets up as high as the roof. So far it is not very beautiful because the transition from the stonework to the skyline is abrupt. Then the roof is built, ending in a peak, and a tower is added, gradually tapering off to a point. A thing of beauty has been evolved because the transition from earth to skyline has been made gradual. But still the work is not finished. The ground around the church is graded and sown to seed. The look of the earth against the stone is not very attractive. Then the grass comes up; it begins to appeal to us. The line along the stone base of the church has lost its abruptness and we like it better. Now comes the landscape architect and groups bushes and trees

about the foundations. The transition from nature to architecture has become more gradual and our aesthetic sensibilities are still more pleased. Now comes age and chips off the hard lines of the masonry, plants lichens and moss in the cracks, and clothes it in part with vines. Nature has triumphed and made that church a part of herself. The transition from the landscape to the work of man has become so gradual that it is the highest kind of art.

We may say the same of a crude house a workman built many years ago. It was so hideous that a man of aesthetic sensibilities shuddered, but Nature softened and weathered the glaring paint, planted moss among the shingles, and overran it with its own luxuriant growth; and, now, you will see an artist with his easel set up before it making a masterpiece. It has become real art through the gradual transitional touch of the great artist of the ages.

The human figure is a poem of gradual transition from one member to another, and as such is justly the center of teaching for our art schools.

The same holds good in any class of paintings. The man who paints in hard lines with abrupt transitions rarely makes a success. To be a piece of art the various elements of a picture must be softened into each other. This discovery created the impressionist school, which is merely an extreme of what all true artists attempt. The charm of a night scene lies in its gradual transitions. The beauty of all unpainted landscapes lies in the same element. The air itself is blue and lays a film over all we see, softening the outlines of everything in life. This explains why a picture of a group painted in hard outlines is at once picked out as the work of an amateur, for things rarely actually appear that way

in life, and if they do they are what we call the ugly things. Thank heaven ugliness is usually doomed, for Nature is continually at work clothing everything with the age charm.

Having found out what art is, the artist must necessarily be one who has this intrinsic appreciation of gradual transition, with the added ability of expression. The artistic nature must be then two-fold, and be able both to appreciate and to express. The most successful decorators have been those who unconsciously could appreciate the beauty of having but one predominating tone to a room, and having all their color effects soften into this one general scheme, according to the law of gradual transition. To this we owe the present beautiful style of finishing our rooms in various tints of but one color. We have risen above the crude age of abrupt change. The most successful milliner is one who can evolve a hat with the most gradual transition from the face and hair to the sky line.

Having now concluded that the artist must have the ability to appreciate and express gradual transition, how can one scientifically classify a person's artistic characteristics?

First, as to finding artistic sense, this can be done by showing the subject (the one under test) a series of ten pictures or designs, five of which are good and the other five bad. His sense of the artistic will be mathematically determined by the number of good ones selected.

As an illustration of the above test, we asked some salesmen of the Henry Bosch Company to pick out the five wall patterns they liked best from a selection of ten in their catalogue, and we afterward submitted this test to a number of other people. We had previously

picked out the four which conformed to our law in color transition and one which was abrupt in color change but beautiful in line transition. We had further found out the popular opinion in these designs by asking the manager which ones sold best.

This test proved very interesting, for we found that popular opinion unconsciously obeys this law of gradual transition, since the vote selected the same four which we had chosen for gradual color transition, and rejected the one which we admired for its beautiful line transition but which was abrupt in color change. The salesmen divided about evenly between popular opinion and their own idiosyncracies. It is just to say that the appeal was made to intelligent rather than to the lower element of people. The test was especially satisfactory from the standpoint that it shows that our law is not an arbitrary one, as against many proposed laws of art. An apparent exception to the rule is the recent fad for check and bar patterns, but even here patterns in two shades of the same color are more pleasing than the abrupt designs, and the fad itself we believe to be a desire for oddness rather than for beauty.

The results from the wall-paper test are significant from the fact that it shows a means by which handlers of goods could save many thousands a year by heeding this law, instead of choosing by their own taste, and by submitting a choice in designs to popular vote among a sales force before loading shelves with unsalable goods. Furthermore, as our study of standards is for the purpose of choosing the right employee, it stands to reason that where other qualities are equal, the salesman who represents in himself popular opinion should be more successful than one of eccentric tastes.

Such a salesman can be found by the tests we outline.

Again, here is a direct, and it seems to us an almost conclusive test for a buyer of decorations. Among those tested we found two who in a few seconds picked out exactly the five patterns which were the best sellers. One was a layman who had never seen the designs before. Granted that this man had technical knowledge of the trade, he would certainly be almost infallible in his choice of goods and would secure for any firm a quicker turnover than one who did not represent popular taste. The other was an assistant manager of Lord and Taylor's who also had this natural faculty of knowing cultured popular taste, since he also chose the five most popular designs. Why then, if it is possible to standardize a buyer, mathematically, as to this ability, do we still use the old haphazard methods? This is only an illustration of the application of standardizing to every kind of employee.

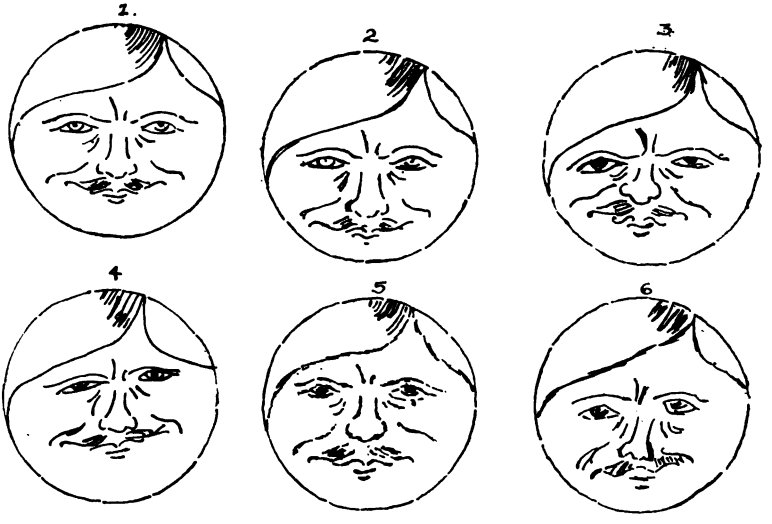
When we come to a person who has to have not only artistic taste but the ability to express it with his hands, tests have to be adapted to the particular trade. We have made none in the technical trades, but have studied drawing to some extent.

Drawing

This is not an elusive characteristic to classify. It can be very accurately determined from the fact that the elect have very acute faculties of estimating space, proportion, and line transition. Formerly the professor of art in a school marked by personal estimate, but we have devised a method to plane out the personal element and reduce gradings to a standard basis by which the layman can mark almost as well as a pro-

fessor. The subject who is being tested is required to draw an object from copy. This object is enclosed in a geometrical outline, already prepared for him to work within, and the copy also is enclosed in a like geometrical outline. To illustrate, the subject is required to draw a face inside a circle. When the drawing is finished, a duplicate face on tracing cloth or celluloid is laid over the drawing and by this the relative accuracy can be very closely determined. In this test we grade up to 10 as the maximum, and in fixing the average we rather arbitrarily allow 5 for accuracy of proportion, 3 for the freedom or transition in stroke, and 2 for balance.

The freedom of swing or of line transition is usually the determining element in distinguishing the picture artist from the decorative worker, and should be so noted. Winsor McKay while now commercially a picture artist is of the decorative type, having had his training as an architectural draughtsman. One can easily note the beautiful swing in every stroke of his Little Nemo pictures. Nell Brinkley is of the same type. She has been appropriated by the newspapers for picture work, but she could really attain enduring fame by decorating the panels of some of our great buildings with her wonderful figure productions. The freedom of her stroke has never been attained so far as we know by any other newspaper artist. This again is an illustration of our law of gradual transition. Take any line of her work and if it is not a poem in transition we fail to make our point. Departing for the moment from the nature of the stroke, Nell Brinkley again illustrates our point of gradual transition in the composition of every picture. Her lining draws all parts of the anatomy together. The face and hair



A TEST FOR DRAWING ABILITY

The above show variance in drawing ability and design.

No. 1 is the original from which the others are copied.

No. 2 was made by a well-known cartoonist and most of the essential space measurements are almost exactly the same as the copy except that the features have all been placed lower. The rest are all amateur work and show decided characteristics outside of art. No. 4 is a very decisive character. No. 5 is hesitating but very careful. The respective gradings of 2, 3, 4, 5, and 6, would be 8, 2, 3, 4, and 1. To mark, take separately measures between pupils of eyes, length of nose, width of mustache, width of mouth, width of eyes, height of eye opening, width of brows, and the two extreme limits of hair from tip of parting. Let these together constitute 5 points. Allow 1 point for smooth lines, 1 point for easy curves, 1 point for trueness of curve; and 2 points for balance, covering the slant of features and the making of both sides alike. The total of 10 points gives a standard on which all markings fall automatically into a decimal rating.

are made beautiful by the melting of one into the other. On nearly every face a strand of hair falls loosely across a part of the features to soften the melting of one part of the composition into the whole.

The commercial application of the freedom of stroke is seen in wall-paper patterns, cretonnes, jewelry compositions, art clay products, wood carvings, and all general designing. The thing which distinguishes the successful designer from the general artist who cannot design, is this ability to make a free swinging line. Also, the designer should have originality.

Some may say that it is a cold proposition to measure art by the millimeter scale, but few realize that the ability to express realistic art is just this. The artist has very delicate space perceptions and can judge proportion with the greatest accuracy. Suffice it to say here that, if an artist is making a portrait, the slightest misplacement of a feature line, even a millimeter in distance, means often a failure in securing the proper likeness. However, there are some whom we must acknowledge to be artists who have never been able to paint a correct likeness. These are men or women who have the artistic sense but not the power of estimating space and proportion—who lack the ability of realistic expression, but can give idealistic expression to the thoughts in their minds; and these are to be reckoned with not only in the studios, but in every day commercial life. For these, the first test of artistic *taste* in choosing pictures and designs is usually conclusive, but they should have a further tryout in an hour's test in the actual commercial material with which they are to work. Such tests are an open field for profitable investigation. Such people, even without the ability to paint or draw, may make good mil-

liners, costume designers, rug and decoration salesmen, gardeners, photographers, moving picture directors, etc., provided, always, they have other essential characteristics.

Bear in mind that art is one of the growing necessities of modern life. If you cannot appreciate it your commercial life may depend on getting someone who does; and this is no wandering essay but a distinct, concrete attempt to show how to handle the art element in business.

He who can express gradual transition on paper, or in draperies, clay, wood, glass, metal, or in any medium, has a strong commercial asset; an employer in those lines should know how to find and choose him, for he is a rising figure in the present life.

Chapter XIX

ECONOMY, RELIABILITY, EXECUTIVE ABILITY, SYSTEM, CONVERSATION

Tests: Contract problem. Comprehensibility test. Executive test. Paving problem.

Application to bonded employees, executives, detail men, salesmen, and telephone operators.

Data to be secured from employment blank. Reliability a compound of other traits. Executive ability a combination of traits, both estimated and calculated. Talking profusely may win sales. Pronunciation.

ECONOMY, as an individual trait, is not difficult to determine. In estimating it, the following matters are worthy of consideration: manner of living, number of dependents, scale of outgo and income, bank accounts and property. There are corresponding questions on the employment blank (Chapter III) which cover these points. Some companies go so far as to have these matters verified by a very thorough investigation, considering that an employee must have financial peace of mind to produce the best work, and that a man with money in the bank is likely to be steadier than an improvident man. In places of financial trust we consider provident habits almost essential, as men settled in such habits are much less liable to temptation. Bonding companies make very thorough investi-

gations on these points, and any employer whose employees handle money or valuable goods should either bond them or make these important investigations himself.

Saving habits have also a bearing on steadiness, and this is an important consideration in the employment department. Every new man or woman hired involves training expenses which mount very high in some instances. The provident man is much more liable to stick to his job, saving a company the continuous expense of training new help.

Another point of probable value is the idea which some employers have that an economical man will likewise be economical in his work. This is no doubt true, for while there are those who can feel no hurt at seeing another's money going to waste, there are others to whom waste of any kind is actually painful.

Our principal ratings on commercial economy, as distinct from personal economy, were made on the "Contract Problem" given in the chapter on REASON. The men who have done this problem made fourteen special points on economy which were set as a standard for all to make. Similar problems can be evolved where waste material must be taken into account and where the closest use of the raw material is a factor. The problem given involved the use of tin and wood. Two points were allowed for close use of the tin; two points for most economical shape of case, and two for thickness of sides; one point each for disposal of samples, waste tin, blocks and sawdust, original disposal of tin, blocks, and definitely calculated waste, and finally one point for closeness of writing in the problem. We allowed the last point from the fact that this is one of the few theories on handwriting that

has a high average record; and whatever we may believe of it as a vice, it does seem to show economy.

Reliability

Reliability is a combination characteristic which we calculate from the several factors bearing on a particular job. The time an employee has been with the company is an important factor in this, varying from 0 to 50 per cent of the rating; this is what we call an "internal record," as distinct from the "external" tried on applicants in the employment department. Lateness and absence are also calculable quantities. Many employers give higher ratings for dependableness as shown by these qualities than for spectacular speed records.

Reliability as an exterior rating can be compiled from a combination of *accuracy, reasoning, experience, honesty, concentration* and *will power,* together with largely estimated ability in *reticence, caution, conservatism* and *credulity.* Of these latter four, reticence and caution can be observed from conversation, and credulity from beliefs as expressed in the employment blank.

Executive Ability

Executives may be *leaders, planners, drivers, instructors, initiators,* or *deciders*—rarely all of these, and sometimes but one.

Leadership may be judged from the offices a man holds in his various societies; *planning ability,* from our Contract Problem test described in the chapter on Reason; *driving power,* from observation, such as

squareness and lines of the jaw, finality or coercive form of his conversation; *instructiveness,* from getting him to explain something or the comprehensibility test of Chapter II; *initiative,* from a study of his various enterprises and the number of suggestions he makes; *speed of decision,* from our test on mental speed.

Planning ability necessitates reasoning power, so that the need of good mental qualities is obvious. He should also be a good character reader, which can be determined from our Character Analysis test. Trade knowledge in his particular line seems essential, but a natural executive can very soon pick it up wherever he finds himself. In fact, executive ability seems to include almost every quality already treated; but as no man can be the last word in all virtues, we demand simply as much as we can get. While at present the foregoing qualities are subject mostly to estimate only, we have very rarely failed in the calculated executive record found by taking and combining certain tests shown in Chapter II. We have also used the following test with good results:

Executive Test

A financier bought up four factories making wood and steel filing cabinets. He desired to amalgamate them into one organization. He had an expert report of the economic condition of each plant for the year 1914, which you will find below. You are to assume that these data cover the only vital points involved. The figures are exaggerated to bring out distinct points. How would you proceed to organize and what changes would you make?

	Texas Plant	Phila. Plant	Pitts-burgh Plant	New Haven Plant
Age of Mgr.....	60	60	35	70
No. of hands.....	300	800	300	300
No. of executives..	5	3	5	1
Value of plant.... $	100,000	500,000	400,000	50,000
Mgr's idea of value	100,000	1,000,000	1,000,000	200,000
Total wages.....	150,000	500,000	150,000	200,000
Cost lumber.....	1,000,000	2,200,000	2,500,000	500,000
Cost sheet iron....	1,500,000	2,500,000	500,000	800,000
Cost fuel.....	2,500	25,000	10,000	15,000
Cost freight.....	500,000	400,000	500,000	300,000
Cost other material	200,000	500,000	300,000	100,000
Wood waste (feet)..	3,000,000	15,000,000	12,000,000	3,000,000
Recovery same (feet)	2,000,000	1,000,000	2,000,000	1,000,000
Sawdust waste (tons)	5,000	10,000	10,000	3,000
Recovery same (tons)	5,000	1,000	1,000	1,000
Sheet-iron waste (tons)	1,000	3,000	500	600
Recovery (tons).....	950	2,000	400	500
Total outgo..... $	4,000,000	8,000,000	5,500,000	2,500,000
Total income.....	5,000,000	8,000,000	6,000,000	2,300,000
Estimated Sales Centre:	Newark N. J.	Buffalo N. Y.	St. Louis Mo.	Stamford Conn.

This executive test has been rather surprising in its revelations as to the number of good points which can be made by capable men. In this, as with many tests of this nature, we take as many good points as are found therein by various men, and make them the maximum standard of accomplishment, instead of demanding any preconceived answers of our own.

System

Our ratings upon system have been determined mainly by the methods used by subjects in presenting a solution of the contract problem, points being allowed for margin, numbering of pages, titles, initialing, use of classification symbols, listing of items, and logical arrangement.

We get a rating for *detail* as a subhead under system from the street-paving problem in Chapter II, where the amount of detail is so confusing that only about one person in twenty will get it all.

Conversation

This is an important requisite of salesmen, and is usually rated by the observational method. Some examiners simply lead the subject to talk on any topic, while others explain to him that he is being tested on conversation and give him one topic after another to talk upon, requiring that he shall be versatile enough to have something intelligent to say. It is a strange psychological fact that some people can be induced to buy simply by talk—more by the quantity of language than the quality—so fluency is a real commercial asset. After a salesman has stated his arguments, if he believes talk will land his prospect, let him settle down to talk, talk, talk. With a certain type of mind this seems necessary to close a sale, such a customer usually being one who may need constant repetition of the same idea, or enlargement thereon; and with such type it is dangerous to allow any pause in which he may have time to think.

Conversation may be classified as *profuse, versatile, medium, sparing, convincing, coercive* and *listless;* and we simply underscore the qualities on our index card.

Pronunciation is a sub-rating which is important for telephone girls, and the larger telephone companies make tests therein. There are recording devices which make a graphic record of voice articulation, so that this can be very carefully rated if desired, so far as concerns characteristics of the candidate under examination. The determination of standard, in a province where local custom and prejudice cause wide variations, is rather more difficult.

Chapter XX

THE MATHEMATICS OF TEST SYSTEMS

Weighting tests theoretically and scientifically. Method of finding weight.

THE mathematics of Labor Standardization is just in its infancy. Very exact methods will eventually be evolved.

Where it is impossible to test a set of employees by the law of extremes, calculations are largely hypothetical and depend, as to their usefulness, on the personality of the standardizer. If he is a man of wide business experience, analytical ability, and accuracy, his findings may be accepted as trustworthy; but such men are rare. Unfortunately, many occupations such as special order work and all occupations subject to change, are such that employers have have no means of rating people already on the job. Under these conditions, the work must be very carefully analyzed and the various mental and physical characteristics essential to the job tabulated. Then, according to the wisdom of standardizer, a weight is assigned to each trait analyzed.

Weighting Tests

Very few jobs can be rated mathematically by simply taking the records on each test and adding them up.

Some traits are much more important than others, and must be weighted proportionately. For instance, we examined a set of men doing a combination of executive and statistical work. According to our own fallible opinion, we came to the conclusion that *accuracy* was the most essential quality for the job. We started, therefore, with accuracy, giving it a weight of three. We then judged that *general planning ability* was the next requisite, and gave this a weight of two. Then *character reading, economy, system, detail* and *invention* were considered of equal import at one point each. A man receiving the following ratings thus made an average as shown:

	Test Record	Weight	Final Record
Accuracy	7	3	21
Planning	8	2	16
Character Reading	6	1	6
Economy	5	1	5
System	7	1	7
Detail	8	1	8
Invention	5	1	5
Total test record			68

By making each separate test on a basis of 10 there were seven traits to be weighted; by tripling one and doubling another, we had 10 points of weight. It gave the answer on a percentage basis, since 100 points are the possible maximum, as an examination of these figures will show. In actual practice where maximum attainment cannot reach over 80, as we have found in some trades, two more points can be added to the weight of the more important qualities so that this average will be higher and yet never go over 100.

It will be noted that the above method is subject to the fallibility of the examiner. When we have operations to examine which are already rated on a piecework or bonus basis, we have much surer means of rating, doing away largely with the fallibility of the standardizer. In this case the law of extremes shows a method of calculating weights. For instance, we had a small box-packing operation and the *high average* qualities found may be seen as follows:

EXTREMES

	Worst operators Those with lowest piece records	Best operators Those with highest piece records
End span of hand	20 cm.	20 cm.
Middle span of hand	19 "	20 "
Arm speed	15	15
Right-hand speed	16	18
Left-hand speed	15	16
Hand-and-eye co-ordination	3	3
Accuracy	10	12
Lung capacity	192	193
Hand grip	26	30

Round figures have been used in the above for ease of discussion. Now it will be seen at once that several factors will not be weighed or considered at all, for they came to about the same average on both sides. These are end span, arm speed, co-ordination, and lung capacity. Of this much we are sure and we can drop them. Now the difficulty in the remainder lies in the fact that different units have been used. To make these of equal import we have to multiply or divide the maximum record by a factor that will make it 100,

and then multiply the minimum by the same factor. We then have a list like this:

	W	B	Fac.	W	B	Dif.	wt
Middle span.....	19	20	× 5	95	100	5	1
Right-hand speed	16	18	× 5.6—	89	100	11	2
Left-hand speed..	15	16	× 6.25	94	100	6	1
Accuracy	10	12	× 8.33+	83	100	17	3.5
Grip	26	30	× 3.33+	87	100	13	2.5

Fractions are dropped in the above calculations, and since the difference seems the best method of noting the importance of the weight, these are divided by 5 to get a simple factor for computation and small fractions are again dropped.

As a matter of fact, we have not found the above method to give exact results. After arranging the workers in rotation according to their actual piece records, these weights have to be shifted somewhat to correspond with production. If we could get an ideal situation where every piece worker has equal opportunity to make a record, we might already be able to prove nearly 100 per cent accuracy with this system, but no work as yet has produced such an ideal situation that a theoretical system will not be somewhat deranged by the unequal opportunities of the workers to show their maximum output.

It will be noted in the above weighting that each person's record would have to be multiplied by the factor shown to get his correct standing. Good mathematicians will soon evolve short processes.

It will be further noted that in case the total weights should figure 11 or more, giving a maximum average over 100, it would not be necessarily vital; but, if desired, the whole list can be reduced to 100 by a com-

mon factor. As a short means of calculation where many factors enter, we sometimes do not attempt to reduce to a percentage ratio. For instance, if a set of tests is added together and we find we have an average of 210, a maximum of 230 and a minimum of 170, we do not have to reduce it to a percentage basis to find relative efficiency. A single operator's record, as compared to the average, will usually show us enough.

To find the relative approximate influence of a quality on a piece or efficiency record place the piece record in the same relation as the tabular arrangement, thus:

	W	B	Fac.	W	B	Dif.
Piece Record.....	25	50	x2	50	100	50
Middle Span.....	19	20	x5	95	100	5

It will be found from the above that the differences are in the ratio 5:50 or that the middle span exerts a 10 per cent influence on results. Owing to the many complex factors involved this may not be absolutely correct, but it gives good results.

We have outlined a logical basis for calculating and weighing tests. There will probably be much in the future to be said on this subject and the contributions of other observers and experimenters will be welcome.

Chapter XXI

TEST METHODS AND CONCLUSION

Patience essential to the standardizer. Special test room necessary. Precautions. Personality of the examiner. Equalizing factors. Comprehensibility. Easy tests first. The great revelation.

ONLY a man who has the accuracy and patience of the analytical chemist can secure the best test records. Human nature is very delicately balanced, and unless the greatest care is used, we shall be unable to get the proper reactions in many tests. Some tests, however, are so decisive that they bring results even with amateur methods.

A special room should be set aside for this work where the subjects will always be under as nearly the same conditions as possible. If class work is used, all the tables should have an equal amount of light, or failing in this, records should be kept of the results of each table to see if the candidates thereat have been under any handicap. If any difference is observed, the conditions should be readjusted or a handicap factor calculated for the position. Chairs at these tables should be adjustable to any height, for it is essential in some tests that all arms should have the same position relative to the table. Where possible, the same

kind of tests should be given at the same time each day so that any relative fatigue factor will be eliminated. If tests should vary as to time of day, record should be kept of the hour, and if any difference in attainment is observed, equalizing or handicap factors should be calculated.

Great variance will be found in the tests according to the personality of the examiner. Some standardizers will be able to set their subjects at ease in a few minutes, while others may have trouble from the nervous factor all through the tests. Some will lay more stress on competitive features than others. Some will inspire enthusiasm in those under test, while others will have listless subjects. As long as one man gives the tests, if he is competent, no trouble will come from this difference in inspiration, since all the records will be comparable, being subject to the same personality factor; but should different men give the same tests in an organization, it may not be fair to the subjects to compare an individual record with the average made under another examiner. For this reason each examiner should calculate his own averages and compare them with the general result; and if there is any difference a personality factor should be calculated.

The temperature of the room should always be the same if possible and averages made at one time of the year compared with those secured at another season.

A set of examiners may not find enough variance in averages to worry about; but before ceasing to worry, humidity, light, heat, time, season and personality should all be looked into, or they may cause disturbance in the figures.

Possibly the greatest factor which makes a difference in the personality equations of different stand-

ardizers is their varying ability to make themselves comprehended. Infinite care should be taken to use the plainest words possible and to make every point clear to the subject. At the beginning of every set of tests, note should be made of questions asked and great care taken that future explanations be made so clear that questions will be unnecessary. It is essential not only that the matter be presented clearly, but also slowly enough to be comprehended. In all cases of explanation, the mind receiving must have time to act and record instructions. Before giving the signal to proceed finally with a test, it is usually well to pause and let the idea sink a second and ask if everyone fully understands. This comprehension element in a test is absolutely essential for success. When we have once evolved a good explanation, it is well to commit it, or the basic facts thereof, to memory.

The nervous factor is naturally a source of great trouble. It is well to talk a while to the subjects until they become accustomed to you; "josh" them, if you can; tell a joke; do the fatherly act. Taking the color of their eyes and hair and facial characteristics often amuses them, and as soon as you get them to smile much of the trouble is gone. First, take weights, heights, and other measures that are not affected by nervousness; this will accustom them to your personality; then lead up from the easiest to the hardest tests. Use competition, as much as possible, for this will make them forget themselves and they come to enjoy it. The employees within a factory, when they find what is going on and hear of the records others have made, very often feel hurt if they are not given a chance also, so that we have found little difficulty in getting people to take the tests.

It will be seen from these advices and warnings that success in a test system cannot be expected unless the project is entered upon with the decision to give it the greatest care and attention. The man who handles it is to have the picking of your future executives to decide the destiny of many people, and he must be of the calibre to handle a large and delicate job.

The Diamond Mine

There are mines in this world which are not in the bowels of the earth, and sometimes we make discoveries of such mines of unexpected resource. We will end these chapters by disclosing such a great discovery. To any manufacturer whose output runs into the millions what we have to say now will be worth many thousands, possibly hundreds of thousands, a year. You will say that such mines are not disclosed with the openness that appears here, that you are going to get something trite.

The strange thing about what we are going to tell you is that you know it already. Even more, you have used it; and now you know you are going to be fooled; but not so, there is a great difference between knowing a thing and *realizing* it. We made this valuable discovery directly in a complicated problem which we gave a number of men to solve. All of a sudden it dawned upon us as a great light. We knew the sun was in the sky but this day we looked at it and the light blinded us with the revelation. You are asking, "Why all this preparation? Spring it! Spring it!" but to tell you something you know will not sufficiently impress you without the proper introduction, and we consider this one of the great discoveries of unfathomable

value which men have unearthed. We claim no originality therein. Others have found it also and we are now disclosing their secret. If the reader will but realize and make this thought his own, it may mean vast riches for himself or his organization and he will not have read this work in vain. This introduction may savor of the circus barker, or the patent medicine orator but we wished you to pause and appreciate the revelation fully before taking the plunge. Kindly excuse the flamboyant language and listen! The discovery is this:

No one man can think of everything.

There you have it at last. Commonplace, isn't it? Of course, you knew it; but now think awhile, let it sink in, and we will reveal something further. In this complicated problem which we gave out various factors were involved of economy, arrangement, system, planning, etc. The solutions varied from genius to mediocrity, but the solution of the most gifted genius of the class would have meant a loss of from $25,000 to $50,000 a year to his company, as compared to a composite of the best points from the solutions of the thirty men who tackled this problem. The solution of this genius represented about the best human possibility in this line. We might have tried hundreds of men and yet we doubt if we could have received anything much better from any one man. In labor standardization we cannot expect any one man to be the sum of business virtues.

What, then, is the application?

In the planning department of a factory where a new machine is to be built or a new outlay made for the works, the obvious thing is not to ask one or two men of the force to work the thing out, but to give it to

everyone there. If the work is important and the planning force varies from ten to one hundred men, give the problem out, tell the whole force to sketch up a solution, send them home for the day to think it over; and, if they don't have something the next day, dock them a day. It may cost $100 of one man's time to solve it by present methods, but say this plan would cost $500 for the day the force is off. If the problem is an important one, this $500 apparently lost in the planning department may mount up to $500,000 or $5,000,000 profit in the years to come. Your one or two men to whom you ordinarily would give this solution may be wonderfully clever, but they can't equal the knowledge and genius of the whole force, if it is competent.

One great result which we feel that standardizers have attained so far is the plumbing of the depth of human fallibility; and if the reader never uses the system we have outlined, we have given this final thought in the hope that he can find at least an almost infallible method of combating fallibility.

APPENDIX

Some tests are given here which were developed after the text of the book was written. With the exception of the stenographic test they are still in the experimental stage, but those interested may like to try them out.

The Stenographic Test

The test we give here is a very quick and conclusive test of stenographic ability. It shows the speed at which dictation can be given, and when typed it shows the relative accuracy and resourcefulness of reproduction. It is a good idea to redraught this test for your own business, retaining the same divisions and numbers of words therein. In this adaptation it is well to include twenty or more technical words peculiar to your business, so that it will be a test in terminology also. There will be a place in the dictation where most stenographers will stop or very evidently lose the drift of thought. The speed per minute will be that indicated in the last paragraph before this occurs. We tested out a class of stenographers on a railroad by this method, and we found that marking for absolute accuracy of reproduction gave a fair arrangement of the members of the class according to their known ability; but when we arranged them in rotation accord-

ing to the exact reproduction of *the sense* rather than the same words, the arrangement was such that no one in authority took any exception to their relative placement. By giving this test to all your stenographers and classifying their skill as to sense reproduction, you will find their average ability; and this average, rather than maximum, makes a good adaptable standard for new employees. The examiner should practice until he gives out the dictation in the allotted time, always with the second hand of a watch to guide him. The following instructions should be carefully given:

Instructions to Stenographic Subjects

I am going to ask you to take some dictation. I will begin slowly and gradually increase the speed and will be going so fast towards the end that you will probably not be able to get it all, but do not let this discourage you. Simply get as much as you can. Begin a paragraph after every pause I make. I will dictate only eight paragraphs; the first with but ten words and the last with thirty-three.

(Total time, 80 seconds)

Dictation, first ten seconds.
(at 60 words a minute)

We have received a complaint from you regarding our deliveries.

Dictation, second ten seconds.
(about 80 words a minute)

We hope that in view of the general railroad blockade you will be considerate.

Dictation, third ten seconds.
(about 100 words a minute)

Our goods were shipped, as the bills of lading show, thirty days before scheduled time of contract.

Dictation, fourth ten seconds.
(about 120 words a minute)

We naturally feel and believe that the fault does not lie in us but in the present congested freight situation.

Dictation, fifth ten seconds.
(about 140 words a minute)

However, this does not give you the goods, so we have put a tracer on the job to disentangle the trouble if possible.

Dictation, sixth ten seconds.
(about 160 words a minute)

If we can find them anywhere within trucking distance of your plant and there is no chance of movement otherwise, we will pay for truck haul.

Dictation, seventh ten seconds.
(about 180 words a minute)

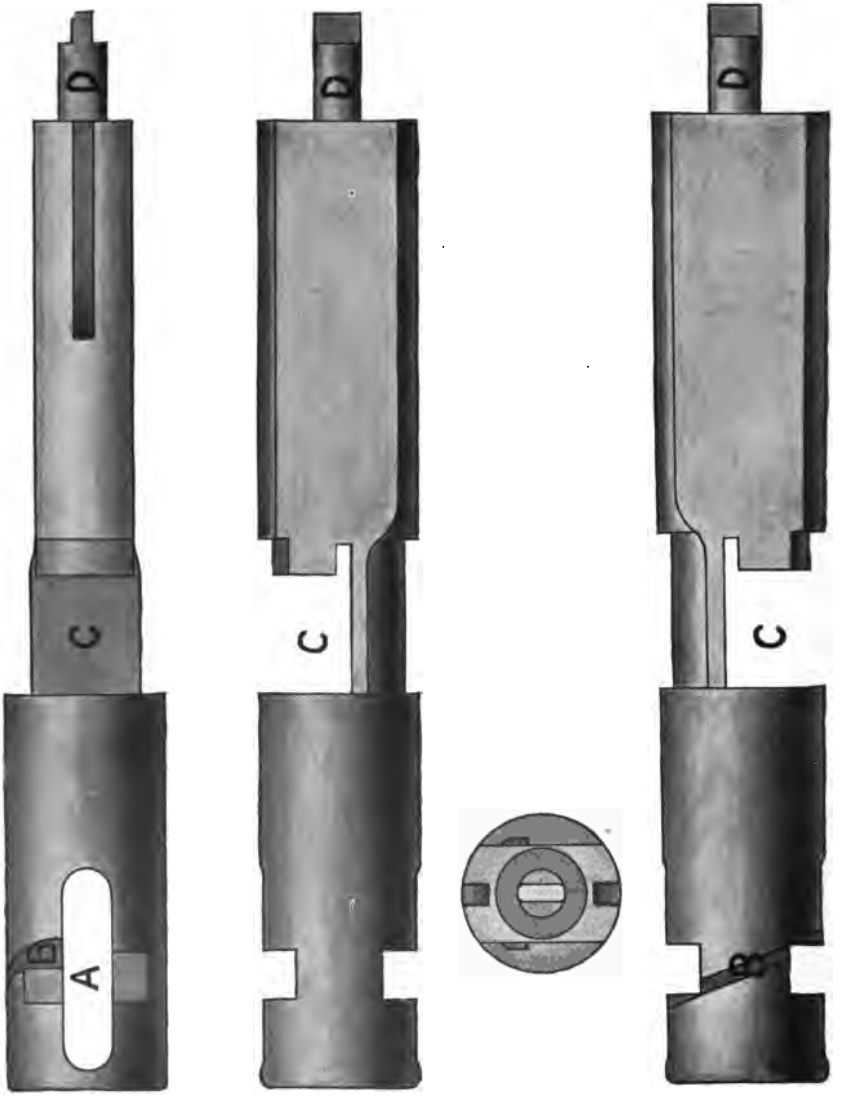
Meanwhile, kindly notify us if you should receive the goods yourself, or locate them, so that we can call off the tracer. Telegraph us immediately if they have already arrived.

Dictation, eighth ten seconds.
(about 200 words a minute)

In order that this trouble may not arise in the future, we are to-day shipping you the assignment due sixty days hence. We hope this precaution will more than insure its prompt delivery.

Expert Machinist Test

The test following is, as yet, only on a trial basis, and its usefulness remains to be proved. Theoretically, it should classify the men fit for superintendents or foremen, or for experimental work and efficiency and planning-department work. Part of it should also be useful in finding the relative ability of the lower grade men, although great care should be used in not demanding too much of them. It should not even be


D
C
B
A
D
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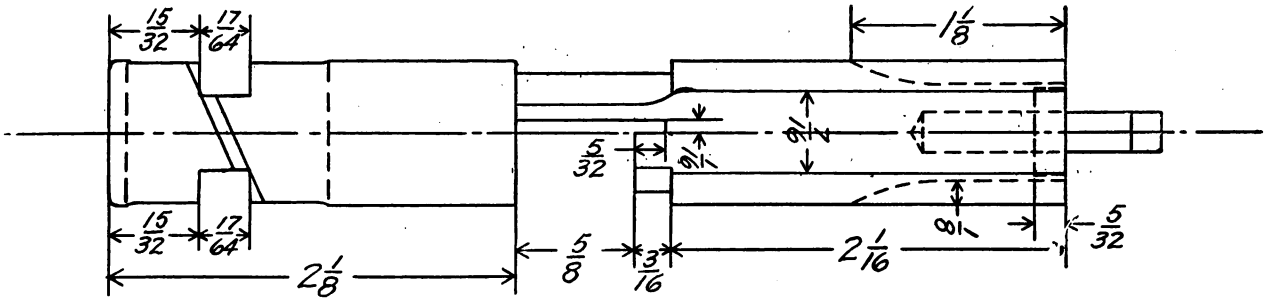
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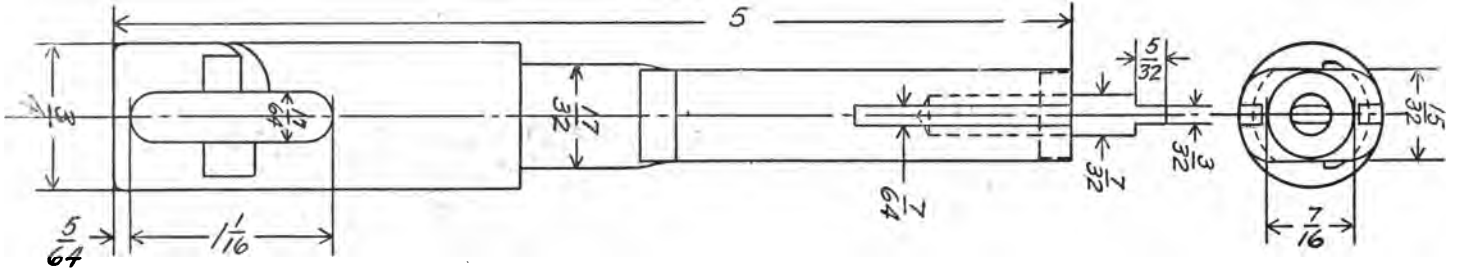
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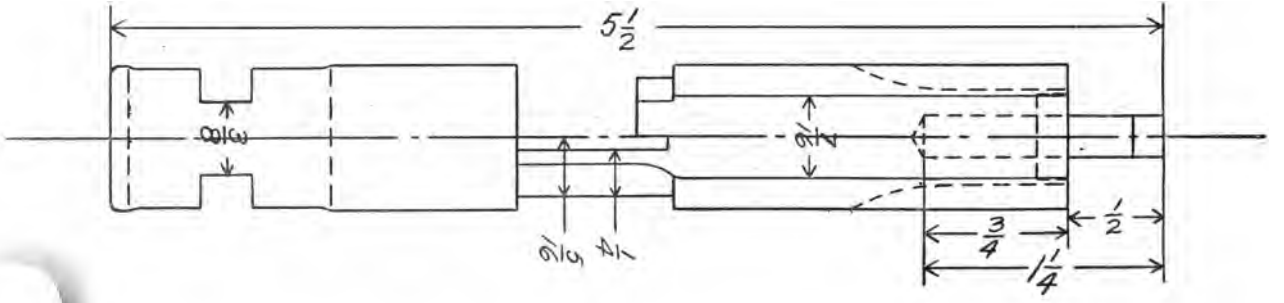
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submitted to men who cannot read drawings. The examiner should glance over the sheets, while the subject is marking them, and orally explain where the subject lacks comprehension.

Expert Machinist Test

The following questions are asked in order to find fitness for the very highest grade work, and also to find whether you could handle a foreman's job. You are not expected to answer anything you do not understand. All that is asked is for you to do the best you can.

1. Look over the drawings which are marked with dimensions. Then look over the shaded pictures which are supposed to represent different views of the same finished piece. Do not be afraid to mark up these drawings and pictures. Mark any portions of the shaded drawings which show that the piece is not finished. Take a scale and measure the shaded pictures and compare with the dimensions shown on the drawings. Make a cross on the shaded pictures where the piece does not measure right, and also make an arrow point pointing to the figures on the figured drawing showing each dimension that has been made wrong in the finished piece.

Supposing that only one piece was to be made from these drawings, how would you answer the following questions? Tell what tools and machines would be used.

1. How would you make the hole marked *A*?
2. How would you make the slot marked *B*?
3. How would you make the slot marked *C*?
4. How would you make the pin marked *D*?
5. (Only those ambitious to be foremen need answer this and the last question.) What changes in process would you make from above answers, if the piece was to be made in 100,000 lots?
6. How would you plan work for the whole piece in 100,000 lots?

Additional sets of this test can be obtained from "Industrial Management," 140-142 Nassau St., New York. Doz., 50 cents; 100, $2.50; 1,000, $10.00.

Human-Interest Test

This is a test which is still being tried out. Theoretically it should give us quite a mental map of the brain of the person under test. When brought to perfection, it may give us dependable calculated ratings on such evasive qualities as activity and passivity, whether the person is one who is constantly acting on the outside world or simply receiving. It should classify distinctly the field in which the interest lies, which is immensely important for salesmen and workers in some other occupations. It should classify the worker as an outside or an inside man, and one who works best in small or large things. It should give a dependable rating on fellowship, self-interest, masculinity, effeminacy, mental sensitivity, and other traits. In testing jobs, an analysis of the vote on each item, comparing the verdict of the best workers with that of the worst, should show whether that item has any significance in the specific job. This, however, is all theoretical at present; nevertheless, examiners may get some interesting data by trying it out. We have already endeavored to classify such traits by asking subjects to tell us their preferences, but so few people have the imagination to think up what they really like that this method of doing the thinking for them has been evolved, leaving to them only the effort of making marks, and it is hoped this will prove more successful.

Human-Interest Test

In the following list of things you are expected to express your likes and dislikes by underscoring them or crossing them out. It is of importance that you do not mark, in any way,

things that do not affect you one way or the other. Take plenty of time and read every word carefully. If it is something you especially like, underscore it. If you like it very strongly, doubly underscore it by drawing two lines under it. If, on the other hand, you dislike it, draw a line through it. If your dislike is so strong that you hate it, or it antagonizes you greatly, draw two lines through it. If you do not know what it is or it does not move your feelings in any way, pass it and do not mark it in any way.

I like and am interested in the following things:

Out-door sports—Baseball, golf, cricket, polo, tennis, shooting, skating, bicycling, diving, gymnastics, football, running, racing, autoing, horseback riding.

Recreations—Seashore, swimming, fishing, yachting, boating, voyages, hunting, country, mountains, nature, to keep going, travel, changing scenes.

In-door sports—Checkers, chess, puzzles, billiards, pool, bowling, dancing, pinochle, poker, whist, solitaire.

Social Life—A jolly crowd, good fellowship, many friends, chums, crowds, social functions, club fellowship, church work, politics.

Nice Things—Jewelry, diamonds, pearls, opals, fine clothes, up-to-date style, silk underwear, white clothes, dark clothes, gay clothes.

People—Fat people, thin people, blonds, brunettes, tall folks, short, Germans, French, English, Irish, Christians, Jews, Negroes, Chinese, Protestants, Catholics, Christian Scientists.

Self Life—Solitude, but few friends, to walk alone, to sleep alone, to meditate, to dream, plans, single life, married life.

Recreative work—Gardening, farming, chickens, pigeons, photography, photo developing, wood working, metal work, electric work, wireless work, modeling, sculpture, designing, painting.

Animals—Horses, cats, birds, canaries, parrots, robins, wrens, wild animals.

Dogs—Mastiffs, bulls, collies, spaniels, terriers.

Home Life—Cooking, nursing, embroidery, sewing, trimming hats, marketing, shopping.

Children—My own children, any child, babies, little girls, little boys.

Reading—Love stories, problem stories, character stories, adventure stories, the Bible, humorous stories, business stories, detective stories.

Authors—Libby, Nick Carter, Hall Caine, The Duchess, Lincoln Steffens, Mark Twain, Phillips, Nietsche, Bernard Shaw, Mrs. Ward, Poe, Browning, Whitcomb Riley, Shakespeare, Longfellow.

Studies—Occult literature, palmistry, clairvoyance, reincarnation, new thought, phrenology, uplift work, authorship, languages, geography, history, science, metaphysics, botany, political economy, mathematics, physics, philosophy, chemistry, geology, psychology.

Amusements—Theatre, tragedy, acrobats, comedy, moving pictures, lectures, vaudeville.

Actors—Mrs. Fiske, Russell, Eva Tanguay, Sothern, Mansfield, Charlie Chaplin, Collier, Barrymore, Hackett, Drew, Billie Burke, Maude Adams, Wilton Lackaye.

Music—Bands, opera, musical comedy, violin, Faust, Rigoletto, Mikado, Follies, Chimes of Normandy, Cavalleria Rusticana, slow music, fast, Tipperary, Hot Time, Old Oaken Bucket, Negro Melodies, quartette singing.

Funny things—Us Boys, Polly and Her Pals, Hans and Fritz, Hall Room Boys, Mutt and Jeff, Abe Kabibble, clowns, jokes, repartee.

Art—The Old Masters, character pictures, human figure, scenery, bright colors, subdued colors, big pictures, small pictures.

Colors—Pink, red, orange, yellow, green, purple, blue, violet.

Flowers—Carnations, roses, daisies, tulips, Easter lilies, violets, clover.

Good eating—Rare meat, well-done meat, fish, eggs, lobsters, nuts, sweet things, pie, cake, candy, fried things, bologna, liverwurst, fruit, melons, sauer kraut, potatoes, cabbages,

tomatoes, corn, peas, beans, carrots, sour things, bitter things, chewing gum.

Drinks—Soda water, sweet drinks, tea, coffee, beer, wine.

Table customs—Buttering a whole piece of bread, eating corn with both hands, eating soup from the tip of spoon, cutting lettuce or pie with knife, eating peas with spoon, cleaning dish with bread.

Table service—Speckless linen, paper napkins, chipped china, attentive waiters, change of china with each course, separate courses, tipping waiters.

Baths—Cold baths, sea baths, shower baths, warm baths.

Any weather—Damp weather, rains, wind, fall, winter, spring, summer.

Pleasant habits—Sleeping late on holidays, smoking, chewing, daily naps.

Fads—Antiques, old things, curio collections, stamp collections, insect collections.

Business life—Machines, invention, building, mining, printing, railroads, speculation, draughting, selling, realty, banking, publishing, writing, accounting, statistics, buying, garment making, advertising, acting, theatrical.

Professional—Architecure, law, medicine, chemistry, art, engineering, factory economy.

Pleasant job—Work with tools, inside job, outside job, machine job, desk job, bench, inside selling, outside selling, superintending, inspecting, sewing, typing, clerking, physical work, mental work, small fine work, big work, job with change, repeating job.

Many people have a strong dislike for the following things which are repulsive to their senses. Underscore as above if you like them, but *be sure* to express your strong dislike by *crossing out* the things you hate, detest, or which repel you.

Seeing—Dirty hands, dirty clothes, dirty children, red hair, disordered desk, disordered room, cross-eyed people, deformities, creepy things, worms, spiders, bugs, mice, lightning, sight of blood, dark rooms, darkness.

Hearing—Noise, interruption, banging doors, noisy children, thunder.

Nasty odors—Fishy, oily, paint, factory smells, hospital smells, garlic, cabbage, onions, cooking, human odors, alcoholic odors, stale beer, whiskey breath, smoky clothes, tobacco, perfumes, tuberose.

Feelings—Cold water, cold weather, a slap on the back, to touch velvet, pain, being touched, promiscuous kissing, kissing.

Mental—Smutty stories, vulgarity, oaths, slang, gossip, argument, talk, dish-washing, religious talk, sick rooms, cheap things, calling by first name.

Copies of this test can be secured from "Industrial Management," 140-142 Nassau Street, New York City. Doz., 50 cents; 100, $2.50; 1,000, $10.00.

SELLING-TALK AND SELLING-METHOD TESTS. DIRECTIONS FOR MARKING

To mark the tests, the questions should be submitted to the five best salesmen of a firm, who will place a number in each space as directed. Each question should be then taken separately and the numbers thus secured added together. When the total additions have been made for each question, number the list, putting the questions that made the least sum first, and so on in rotation till the highest comes last. In case two or more questions should get the same position by this method, let the vote of the head salesman determine the relative position of these. The relative position thus established for the questions is the standard position; and in marking new papers, ten points are allowed on each question for exact placement in

this position and one point subtracted for every position up or down, away from this exact placement. If on trial the five worst salesmen should make the same average as the five best, the test is of no significance. The importance of the test may be judged by the greater or less variance in these averages. It will show but one quality of salesmanship and is not conclusive of all qualities. The records for each of the above tests should be kept separate, for one may prove of value and the other may not. Standard arrangement will vary according to the kind of product sold.

Selling-Talk Tests

In the following ten talking points for selling goods, place in the space opposite each a different number showing its importance in your mind. Number them so that one (1) is the most important and two (2) the next in importance, and so on to ten (10) the least important.

Cheapness of goods.....(2)
Quality of goods.....(1)
Prompt Delivery.....(8)
The name of big users.....(6)
The vast quantity of users.....(7)
Bad quality of rival goods.....(10)
Responsibility of your firm.....(3)
"Our advertising will clear your counters".....(5)
Social talk before arguments.....(9)
Age of your firm.....(4)

SELLING-METHOD TEST

Classify the following list, from one to ten, by the same methods as above and show your opinions as to the following qualities and methods of salesmanship:

Knowledge of goods.....(1)
Handing out compliments.....( )
Grading size of order.....(5)
Buying drinks.....( )
Industry of salesman.....(2)
Fellowship of salesman.....(4)
Sincerity of salesman.....(3)
Coercive quality of salesman.....(7)
Persistence of salesmen.....(6)
Handing out cigars.....( )

Additional copies may be secured from "Industrial Management," 140-142 Nassau Street, New York City. Doz., 50 cents; 100, $2.50; 1,000, $10.00.

Standard Test Sheets

(Sold to Employers Only)

The tests in this book are reprinted on sheets 8½x11 inches in size,—a convenient size for use and filing.

They are furnished only to employers or instructors in psychology, and no orders for them will be filled unless written on business or school stationery, properly signed with the name and official capacity of the person ordering them.

In most cases the wording will be different from the specimens in this book, in order to protect the user from an applicant who may have seen this book and studied the tests.

No. 1. Tests for Clerks and Executives
(Pamphlet containing twenty-two tests outlined in Chapter II.) One dozen, $1.50; 100, $10.00; 1,000, $80.00.

No. 2. Tests for Clerks and Executives
(To replace No. 1. Gives another set of questions of the same character.) One dozen, $1.50; 100, $10.00; 1,000, $80.00.

No. 10. Standard Index Card (page 52).
On Paper: 100, $2.00; 1,000, $17.50. On Card: 100, $3.00; 1,000, $25.00.

No. 11. Selling Talk and Selling Method Test (pp. 332, 333)
One Dozen, 50 cents; 100, $2.50; 1,000, $10.00.

No. 12. Expert Machinist Test (p. 324)
One Dozen, 50 cents; 100, $2.50; 1,000, $10.00.

No. 13. Human Interest Test (p. 327)
One Dozen, 50 cents; 100, $2.50; 1,000, $10.00.

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